# Journal of FORESTRY

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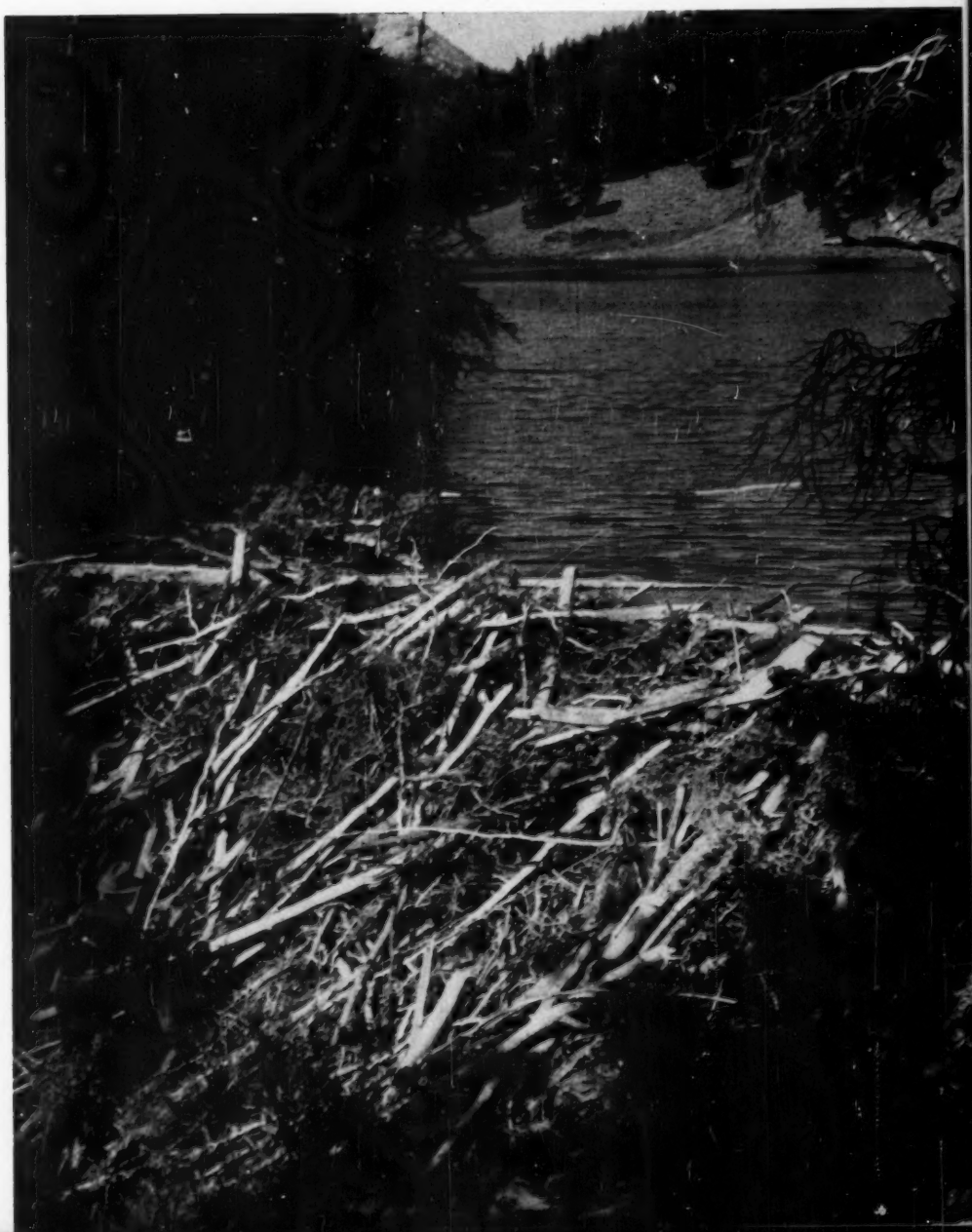

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# Beaver Ecology and Management in the Rockies

**James E. Grasse**
Biologist, Wyoming Game and Fish Commission, Cheyenne.

STUDENTS OF ECOLOGY realize that all forms of animal life have some effect upon their environment. In some instances the effect may be obvious and of considerable economic importance. An example would be overgrazing by game animals or livestock which would tend to kill out the more desirable forage plant species. The effect of most mammals on the area they inhabit is more or less obscure, however, and usually not noticed except by trained observers. The effect, too, is usually detrimental to the land and, often, through competition among species, is detrimental to other mammals using the same general area.

Of all the mammals, excluding man, which inhabit the earth, beaver undoubtedly bring about the most extensive change in their environment. The changes they make are intended for their own benefit, but usually have far-reaching effects upon the ecology and land management of not only the immediate area, but also of tremendous areas downstream.

One need only study the physical characteristics of beaver and observe their actions on dry land to understand that, although partly terrestrial, they must have deep water to exist. Their disproportionately short legs and large, fully webbed hind feet are admirably adapted for swimming and for work in and around water, but make for awkwardness on land. The beaver is strongly built and has sharp teeth and powerful jaws. In water he is able to defend himself against any of the carnivors, but on land his awkwardness renders him virtually helpless against even a bobcat or a coyote.

Beaver need deep water for reasons other than protection from enemies. Since the beaver is slow and awkward on land but fast and powerful as a swimmer, travel and the transportation of food and building materials are much easier and faster through water than overland. This explains the need for secondary dams and canals and is the principal reason why beaver ponds occur in series. A single colony of beaver may build and keep in repair as many as ten or fifteen dams.

The same instincts which cause a beaver to store water for his own and man's use also cause him to build dams which result in damage to man's interests. Beaver damage to a rancher or farmer means interference with irrigation, flooding of crop land, the cutting of fruit or shade trees, and the drowning of livestock. To the forester or highway engineer, it means the plugging of bridges or culverts, the flooding of roads, and the blocking of stock driveways. In some cases beaver status is not clear-cut; that is to say, his activities may at the same time be beneficial and detrimental. Under such conditions, study and thought should lead to adoption of a proper management practice. As a result of superficial damage, beaver have on many occasions been removed, when actually a rational evaluation of their activities would have shown them to be substantially beneficial. Conversely, serious damage has sometimes been endured when beaver contributions have been trivial by comparison.

The kind of beaver pond most commonly seen by man, i.e., the type occurring far down on a drainage, is of debatable economic value. In areas where land use is intensive, these ponds are quite often detrimental to agriculture, transportation, and other interests. In such low-elevation areas they may or may not improve the stream for other wildlife and may or may not affect stream flow, stream-bed erosion, or water conservation.

On the headwaters of high-elevation mountain streams, however, there can be no logical debate as to whether beaver are beneficial or detrimental. They are beneficial and usually make contributions far out of proportion to the credit they receive.

The cover of this issue of the JOURNAL shows a beaver pond near the head of Coal Creek, Sublette County, Wyo. This pond measures 4,680 feet in circumference, covers over 25 acres, and impounds 10,740,500 cubic feet of water. This is not cited as a typical beaver pond, for it is several times larger than any other known to the writer. The impoundment of such a great volume of water by a single beaver dam is impressive, but no more effective from the standpoint of stream flow stabilization and water conservation than the impoundments resulting from *many smaller dams* similarly located on the headwaters of small streams.

A study of the cover shows that none of the approximately one second feet of water which flows *out* of the pond flows *over* the dam. It all percolates through. Another fact of significance is that the stream which flows out of the pond more than doubles in size within a quarter of a mile below, indicating that the percolating effect is not confined to the dam itself, but takes place through the soil under and downstream from the pond. The stabilizing effect of this pond

upon the flow of Coal Creek is immediately apparent. Long periods of drouth or periods of heavy rainfall or even snow run-off make little difference in Coal Creek's flow. If the water flowing into the Coal Creek beaver pond were completely cut off, the stream would continue at approximately its present rate of flow for 117 days.

Overgrazing, denuding of forest lands by poor logging practices or by fire, and poor farming practices, have been largely responsible for the very serious flood and silting problems on major river bottoms in recent years. However, these conditions would be materially improved if beaver were allowed to occupy the headwaters of all streams in the United States offering suitable beaver habitat in which beaver would not interfere with other land use. Beaver were planted in Coal Creek in 1941. The effect of beaver on the waters of Coal Creek seems very small indeed as this stream finally reaches the Colorado River; however, multiplied by several thousand, as it could be by the restoration of beaver, the effect would be amazing.

**Effect of Beaver on Other Wildlife**

The field work upon which this article is based included very little formal study of the effect of beaver on other forms of wildlife; however, the observed benefit to some forms was obvious and merits brief mention.

Waterfowl: The beaver colony which did not accommodate at least one brood of ducklings was indeed an exception. Even new beaver colonies seemed to offer attractive conditions for ducks to raise their broods. On one occasion we drove up to a large beaver pond beside the road and were about to look it over as a possible live-trapping site when an old mallard hen with a clutch of eight small but exceedingly active young swam out of the willows into view. Within ten minutes another mallard clutch and two teal clutches appeared. Subsequent observation proved that this one pond was the home of four families of ducks.

Muskrats (*Ondatra zibethica*) are also attracted to beaver ponds, especially to old ones. We have often seen muskrats entering the houses or burrows of beaver. Casual observation would seem to indicate that the relationship between beaver and muskrats is that of a rich and provident landowner (beaver) to a rather poor and shiftless relative (muskrat). The muskrat apparently takes advantage of all the beaver has to offer in the way of shelter and travel ways, and even goes so far as to clean up after the beaver at meals. In return, the smaller rodent, apparently contributes nothing. Small wonder that he is passively disliked by the beaver.

Mink (*Mustela vison*) are probably more attracted to beaver pond areas by the secondary occupants (muskrats and trout) than by the ponds themselves. An observation from our notes is illustrative: We had just approached a beaver pond when a blue-winged teal and her clutch of seven young made a frantic and noisy exit from a bush in which they were hiding at the pond's edge. They were closely followed by a mink which showed little interest in their flight. He obviously was not duck hunting. The mink then proceeded to put on a dazzling show of aquatic speed. He would dive, then reappear 50 feet away in what seemed the same instant. This performance went on for about 3 minutes, and then the mink disappeared. Thinking that the show was over, we were about to move on when the mink surfaced near the center of the pond with a 10-inch cutthroat trout (*Salmo clarkii lewisi*) in his mouth. This and other observations seem a clear indication that mink prey upon trout, but it is known that many other animals, terrestrial as well as aquatic, are commonly taken.

Muskrats are also known to be a favored item of mink diet. We believe that on many of our streams mink predation is the limiting factor for muskrat. Our opinion in this matter is shared by many who have made specific, detailed studies and so are more qualified to write. Errington (*1*) states, "The mink (*Mustela vison*), valuable fur bearer itself, has received special condemnation from the fur industry for its depredations on muskrats. Under conditions favoring easy predation, a mink may live for four weeks or a month at a stretch on a virtually straight diet of muskrat and its killing, too, may greatly exceed its need for subsistence."

Many times we have seen moose (*Alces americana*) feeding in and around beaver ponds. All big game animals obviously benefit from the subirrigation and stream flow stabilizing effects of beaver ponds. However, considerable forage is covered by the water behind beaver dams. In some instances beaver cut aspens and other browse species which would otherwise be utilized by big game animals.

Beaver-Trout Relationship: Comparatively little scientific investigation has been conducted on the effect of beaver ponds on trout. Unfortunately for a clear understanding of beaver-trout problems in the Rocky Mountains, the more publicized investigations were made for the most part on slow, sluggish, and for trout, dangerously warm streams Salyer (*4, 5*) concludes that in general, new beaver ponds are attractive to trout, but that after two years the effect of the ponds is definitely harmful. He writes of streams typical of certain parts of Michigan and does not generalize. However, many who quote him and other technicians do generalize. We were given quite a scolding by an elderly fisherman this summer when he found that we were planting beaver. He said that in his state scientific investigations had proved conclusively that beaver dams were extremely harmful to trout and that we, in our backward ignorance, were working against his and other fishermen's interests.

This view is not shared by the average resident fisherman of wide experience in the Rocky Mountain region. We have several beaver ponds under study at the present time. These ponds vary in size, age, shape, depth, and drainage type. The newest of the study

ponds is over 7 years old and the oldest is over 15 years. They have one thing in common: they offer excellent fishing—in most cases the best in their respective localities.

Rasmussen (*3*) in his study of, "Beaver-Trout Relationship in the Rocky Mountain Region," contends that in general, beaver are beneficial to trout.

A western Wyoming beaver pond was stocked with 12,320 two- to three-inch eastern brook trout on August 21, 1948. As part of a routine study of this pond, which is the result of a beaver planting made in 1941, sample trout were caught on September 16, 1949. The largest of the twelve trout taken was 13½ inches in length, and the smallest was 11½ inches. Average weight was ¾ pounds each, dressed. This pond covers an area of 25 acres, and about one-fourth of its area is more than 12 feet deep. It obviously is, and will remain, an addition of consequence to the fishing waters of the region.

It is generally agreed among fish technicians that the most important factor in trout growth and development is water temperature. The warmer the water, within limits, the faster fish grow. However, the warmer the water, the less oxygen it will support, and warmer water tends to make fish unhealthy and more susceptible to disease. No comprehensive analysis will be attempted here of the effect of water temperature on trout development; however, we do know that since a trout is cold blooded, its metabolism is controlled by the temperature of the water in which it lives, and also that extremely cold water tends to be barren of insect life upon which trout feed. All of the streams we have under study are far too cold for optimum trout development; it is therefore definitely to the advantage of trout if beaver ponds have a tendency to warm slightly the waters of most of our mountain streams.

Beaver will always seek out the warmest water in a drainage. Their need for warm water is obvious: the colder the water in a pond, the deeper the ice on it will become in winter. If ice becomes too deep, beaver will be denied movement under it, their food cache will become encased in ice and therefore inaccessible, and they will starve or "smother out."

Trout have the same problem: the deeper the ice, the less water space remains; feeding range becomes increasingly restricted, and oxygen less abundant. In high elevations winter is the critical season for almost all forms of wildlife, including trout and beaver. Winter conditions which can be tolerated by beaver can also be endured by trout.

We are convinced that beaver activities in the West usually benefit trout; but, in some instances, their effect can be harmful. Beaver dams can, and on occasion do, block trout off from spawning area. Spring spawners (cutthroat and rainbow trout) can usually get over beaver dams, because they make their spawning runs during the high water period. Fall spawners (Eastern brook trout) are often blocked off from making spawning runs, because they spawn when water flow is lowest and beaver dams are in best repair. The fact remains, however, that even though normal spawning of Eastern brook trout should (in theory) be seriously hampered by beaver (and does undoubtedly suffer) natural reproduction of this species on beaver streams is extremely good—usually much better than that of any other trout. On many high-elevation beaver streams supporting Eastern brook trout, natural reproduction keeps trout numbers far too high and therefore reduces average trout size.

On some of our larger and faster flowing streams, beaver ponds become settling basins for silt. Many of our most fertile mountain meadows have been built through this action. There are many who consider this silting detrimental to trout, and it may well be. However, when a beaver pond silts up to serious extent, it is abandoned by the beaver, who build another dam or series of dams above or below the one rendered useles by silt. Beaver dams which silt in rapidly offer trout habitat which is probably not as good as open stream areas; however, trout below such ponds are obviously benefited by the cleaner water.

### Beaver Management Plan

Any beaver management plan must insure that the indirect values of beaver be recognized and that beaver be managed, as should any natural resource, to the best advantage for the greatest number of people. The part that beaver play in the protection of watersheds, water conservation, stream flow stabilization, prevention of stream bed erosion, improvement of habitat for other forms of wildlife, and so on, entitle this species to a great deal of consideration.

We are convinced that in the Rocky Mountain region, the primary objective of beaver management must be to secure and protect these indirect contributions made by beaver. The monetary value of beaver pelts to individuals in the state, or to the various state governments, must always remain of secondary importance.

This does not, of course, mean that beaver should not be harvested. A reasonable harvest should operate to prevent overcrowding, damage to roads, or loss to ranching and farming interests. Steel-trapping must always be a part of any wise management plan. To allow beaver numbers to build up beyond the carrying capacity of the streams they occupy is to invite disaster. Beaver, like most rodents, are prolific. Under favorable conditions they double their numbers every year. Beaver, properly managed to be of maximum indirect value, will produce a maximum amount of fur.

A stream offering suitable beaver habitat will support, on a sustained yield basis, only a limited number of animals. If numbers are allowed to build up unchecked, beaver will be forced to migrate into areas where they may not be welcome, or congestion may promote disease, which is Nature's

way of reducing populations, especially in rodents. Tularemia is often drastic as a reducing agent and may take not only the natural increase but the brood stock as well. This disease has exacted a toll in several different places in years past, as reported by Jellison, *et al* (2).

The obstacles to good management of beaver are many. Superficially, it may sound simple to state that a given number of beaver will be maintained on an area, in order that their secondary benefits may be perpetuated, and that the natural increase will be harvested. This would leave brood stock and assure the beaver's secondary benefits, and at the same time secure a maximum harvest of beaver fur on a sustained yield basis.

In the first place, however, it is very difficult to determine how many beaver actually inhabit a given area. We have records of instances in which a single pair of beaver have built as many as ten large dams in a single year. On our study area on the Cottonwood Creek drainage, ten beaver built a total of 55 dams in a single season. Unfortunately, there seems to be no simple, easily applied method for estimating beaver numbers. Considerable experience and keen powers of observation are necessary to make estimates of beaver numbers which are accurate enough to be used in formulating an intelligent beaver management plan.

Once formulated, a beaver management plan is hard to carry out. Usually, there is insufficient regular skilled permanent personnel to cope with the trapping problem. Trappers must be hired. Unless very closely supervised, trappers, being human, will take beaver where they are easily taken and leave them where they are hard to reach or to catch. In some cases this works out very well, because as a rule the more inaccessible beaver are most beneficial in water conservation, etc. In many instances, however, beaver which are causing or are about to cause damage are passed up, and instead some other drainage will be completely cleaned of beaver.

Many individuals have suggested an open trapping season on beaver similar to seasons on other fur bearers. This method of harvest is being used by several states. In our opinion, even if the Rocky Mountain region supported many more beaver than it does, an open season would not be possible. Beaver are relatively easy to catch, and the administrative cost of any type of season, if beaver were to be saved from extinction, would exceed profits to individuals. The beaver's contribution to watershed protection alone would far outweight the value of the fur harvest.

On private land no attempt should be made to raise beaver in the public interest. Beaver can be, and on private land often are, intolerable pests. No landowner should be forced to endure beaver depredation without recourse to some sort of relief. These objections are met under Wyoming's beaver law which allows landowners, through fur-farm permits and damage permits, to harvest beaver on their own land. No part of the income from the sale of beaver pelts so taken reverts to the state. The state's policy of taking no revenue from damage beaver trapped on private land implies a measure of responsibility resting with the landowner. If a landowner wishes to retain beaver on his property in the hope of some day realizing a profit from the sale of their pelts he, in effect, accepts responsibility for the damage he may incur from them.

On some types of private land beaver are extremely beneficial, and some landowners protect and encourage them. The planting of beaver on private land by the state should be avoided unless state officials are convinced beyond reasonable doubt that a landowner is sincere in his desire to propagate the animals for the good he and his neighbors derive from them.

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# Statistics from Schools of Forestry for 1950: Degrees Granted and Enrollments

**Cedric H. Guise**

Professor of forestry, College of Agriculture, Cornell University, Ithaca, N. Y. During 1929-1931 he was assistant director of the Forest Education Inquiry and co-author of *Forest Education*. Since 1933 he has assembled and published annually statistics from all forestry schools in the United States.

*This article is another in a series of comparable papers appearing annually in the Journal of Forestry since 1934, reporting the enrollment at the schools of forestry and the numbers of degrees conferred. Statistics of this type were first assembled when the Forest Education Inquiry made its study in 1929-1931, and were published in the Inquiry's report in 1932*[1] *The annual articles in the Journal have brought to date the figures for each successive year.*[2]

THE 1950 STATISTICS from the schools of forestry bring out several significant facts. First and outstanding is the large number of men graduated with bachelor's degrees; second is the general decline in undergraduate enrollments; and third is the continued and steady decrease in the registration of veterans.

The statistics for 1950 are from the same 34 schools that submitted figures in 1949. A slight rearrangement of the schools in the tables has been made this year. No change exists so far as the 22 accredited schools are concerned; however, the other 12 are all placed in one list of nonaccredited schools. During the past several years these nonaccredited schools have been placed in two groups, those listed and those nonlisted. This change is in accord with a recent decision of the Council of the Society (JOURNAL OF FORESTRY, August 1950, page 373).

The 1950 statistics show that 2,321 undergraduate degrees were conferred, that the total undergraduate enrollment is 5,935 that there are currently 1,720 seniors enrolled, and that the number of seniors exceeds by 288 or more the enrollments in any of the other three undergraduate classes. A summary of significant figures for 1950 appears in Table 1, along with comparable statistics for the years 1947, 1948, and 1949. The detailed statistics and the significant trends are presented and analyzed in the discussion that follows.

## Degrees Granted

During the calendar year 1950, the 34 schools of forestry reported that 2,321 undergraduate degrees, 275 master's degrees, and 29 doctorates were conferred.

Of the 2,321 undergraduate degrees, 2,039 were reported by the 22 accredited schools, 282 by those nonaccredited. The figure of 2,039 is 708 in excess of the 1,331 reported by the same 22 schools last year. The 282 is 170 more than the 112 reported in 1949 by the nonaccredited schools.

The total of 2,321 is a significant figure. Last year a total of 1,443 undergraduate degrees were awarded, this 1949 figure being by far the greatest that had ever been reported for the 49 years during which the schools were graduating men. Now in 1950, the 1949 figure is exceeded by 878. This total of 2,321 represents an all time high, certainly for some years to come. It is larger by 591 than the 1,730 students now registered as seniors, and over 875 more than are enrolled in any of the other three undergraduate classes.

In last year's article the prediction was made that the 1950 figure would be 800 or 900 larger than the 1,443 of 1949, and that in 1951 the total number would be in the neighborhood of 1,500. This prediction for 1950 has been borne out; there is no reason to change the estimate of 1,500 for 1951, this being based on the current enrollment of 1,730 in the senior class.

Obviously the peak number of degrees conferred this year is the climax of the trend that started four years ago when the large enrollments of veterans entered the schools. These trends can be seen from a study of Tables 6 and 9. A careful review of the statistics in Table 3 is also well worth while, since it will show what the trends have been during the past 50 years. It is not uninteresting that there were conferred in 1950 approximately the same numbers of undergraduate degrees as were granted during the 25-year-period 1900-1925.

The 275 master's degrees reported this year is 70 more than the 205 for 1949. Of these 275, 268 were awarded at the accredited schools. Although every one of the accredited schools, except West Virginia, lists one or more master's degrees granted, at 4 schools 160 degrees, 60 percent of the total 275, were granted. Yale leads with 44; the University of Michigan reported 42, Duke 37, and the New York State College of Forestry 37. Of the nonaccredited schools Harvard reported 5 and Missouri 2 master's degrees. At the present

TABLE 1.—SIGNIFICANT STATISTICS FOR 1947, 1948, 1949, AND 1950

| | 1947 | 1948 | 1949 | 1950 |
|---|---|---|---|---|
| Bachelor's degrees conferred | 554 | 918 | 1,443 | 2,321 |
| Master's degrees conferred | 223 | 222 | 205 | 275 |
| Doctor's degrees conferred | 7 | 16 | 12 | 29 |
| Undergraduates enrolled | 7,454 | 8,212 | 7,469 | 5,935 |
| Members of freshman class | 2,061 | 1,851 | 1,485 | 1,442 |
| Members of the sophomore class | 2,878 | 2,178 | 1,667 | 1,379 |
| Members of the junior class | 1,577 | 2,497 | 1,816 | 1,384 |
| Members of the senior class | 938 | 1,686 | 2,501 | 1,730 |
| Graduate students—master's | 339 | 330 | 450 | 483 |
| Graduate students—doctor's | 80 | 93 | 98 | 118 |

[1] Graves, H. S. and C. H. Guise. Forest Education. Yale Univ. Press, New Haven, 1932.

[2] Guise, C. H. (Seventeen articles on degrees granted and enrollments at schools of forestry in the United States, 1934-1948.) Jour. of Forestry 32:337-343; 33:402-405; 34:114-120; 35:77-83; 36:12-18; 37:197-202; 38:241-246; 39:359-364; 40:196-202; 41:87-91; 42:357-360; 43:172-175; 44:110-114; 45:174-180; 46:168-173; 47:93-100; 48:165-169.

TABLE 2.—NUMBER OF DEGREES GRANTED FOR COMPLETION OF STUDIES AT SCHOOLS OF FORESTRY IN THE UNITED STATES FOR THE CALENDAR YEAR 1950

| | Undergraduate degrees | Master's degrees | Doctor's degrees |
|---|---|---|---|
| Accredited schools | | | |
| 1. California | 83 | 10 | 3 |
| 2. Colorado | 77 | 6 | -- |
| 3. Duke | -- | 37 | 6 |
| 4. Florida | 67 | 8 | -- |
| 5. Georgia | 99 | 12 | -- |
| 6. Idaho | 67 | 3 | 1 |
| 7. Iowa | 86 | 1 | -- |
| 8. Louisiana | 87 | 7 | -- |
| 9. Maine | 75 | 3 | -- |
| 10. Michigan University | 109 | 42 | 6 |
| 11. Michigan State | 221 | 13 | 1 |
| 12. Minnesota | 88 | 6 | -- |
| 13. Montana | 108 | 3 | -- |
| 14. New York | 193 | 37 | 6 |
| 15. North Carolina | 91 | 3 | -- |
| 16. Oregon | 106 | 5 | -- |
| 17. Pennsylvania | 121 | 5 | -- |
| 18. Purdue | 88 | 6 | -- |
| 19. Utah | 97 | 6 | -- |
| 20. Washington University | 110 | 11 | -- |
| 21. West Virginia | 66 | -- | -- |
| 22. Yale | -- | 44 | 6 |
| Total | 2,039 | 268 | 29 |
| Nonaccredited schools | | | |
| 1. Alabama | 42 | -- | -- |
| 2. Connecticut | 15 | -- | -- |
| 3. Harvard | -- | 5 | -- |
| 4. Louisiana Polytechnic | 28 | -- | -- |
| 5. Massachusetts | 32 | -- | -- |
| 6. Michigan Mining | 36 | -- | -- |
| 7. Missouri | 31 | 2 | -- |
| 8. New Hampshire | 19 | -- | -- |
| 9. Oklahoma | 37 | -- | -- |
| 10. Tennessee | 1 | -- | -- |
| 11. Texas | 7 | -- | -- |
| 12. Washington State | 34 | -- | -- |
| Total | 282 | 7 | -- |
| Grand totals | 2,321 | 275 | 29 |

TABLE 3.—NUMBER OF DEGREES GRANTED FOR COMPLETION OF STUDIES AT SCHOOLS OF FORESTRY IN THE UNITED STATES FOR THE CALENDAR YEARS 1900-1950

| Years | Undergraduate degrees | Master's degrees |
|---|---|---|
| 1900 | 1 | -- |
| 1901 | 5 | -- |
| 1902 | 2 | 9 |
| 1903 | 3 | 14 |
| 1904 | 9 | 29 |
| 1905 | 9 | 34 |
| 1906 | 24 | 24 |
| 1907 | 19 | 27 |
| 1908 | 31 | 35 |
| 1909 | 47 | 44 |
| 1910 | 61 | 48 |
| 1911 | 100 | 61 |
| 1912 | 122 | 54 |
| 1913 | 136 | 37 |
| 1914 | 151 | 42 |
| 1915 | 124 | 35 |
| 1916 | 151 | 36 |
| 1917 | 160 | 27 |
| 1918 | 65 | 10 |
| 1919 | 53 | 6 |
| 1920 | 160 | 25 |
| 1921 | 126 | 26 |
| 1922 | 141 | 44 |
| 1923 | 217 | 31 |
| 1924 | 215 | 43 |
| 1925 | 280 | 44 |
| 1926 | 259 | 58 |
| 1927 | 263 | 50 |
| 1928 | 302 | 64 |
| 1929 | 291 | 54 |
| 1930 | 308 | 69 |
| 1931 | 394 | 97 |
| 1932 | 380 | 78 |
| 1933 | 355 | 65 |
| 1934 | 337 | 47 |
| 1935 | 423 | 58 |
| 1936 | 502 | 67 |
| 1937 | 803 | 75 |
| 1938 | 980 | 95 |
| 1939 | 1,102 | 112 |
| 1940 | 1,072 | 105 |
| 1941 | 834 | 117 |
| 1942 | 654 | 76 |
| 1943 | 446 | 28 |
| 1944 | 106 | 12 |
| 1945 | 51 | 18 |
| 1946 | 192 | 65 |
| 1947 | 553 | 223 |
| 1948 | 918 | 222 |
| 1949 | 1,443 | 205 |
| 1950 | 2,321 | 275 |
| Total | 17,701 | 3,120 |

time, 483 men are registered for master's degrees which would indicate that the figure for 1951 will be between 275 and 300.

Seven schools reported 29 doctorates this year, six each being listed by Duke, the University of Michigan, the New York State College of Forestry, and Yale. California reported 3, and Idaho and Michigan State each one. The doctorate conferred at Idaho was an honorary degree.

Last year only 12 doctorates were conferred. While it is difficult to make estimates for future years, it appears, on the basis of those now studying for the doctorate, that between 30 and 35 will be reported in 1951.

Statistics dealing with the numbers of degrees conferred are summarized in Table 1, presented in detail for the individual schools in Table 2, and shown in total for all schools for each of the years 1900 to 1950 in Table 3.

The total number of undergraduate degrees granted since 1900 from all schools in the United States is now 17,701 (Table 3). Master's degrees conferred since 1902 total 3,120. With the 29 doctorates reported in 1950, the total of these degrees awarded for studies completed in forestry and its underlying sciences now becomes 213.

In February 1950, 42 men completed their training at the New York State Ranger School; in all 955 men have been awarded certificates for the completion of the ranger school course.

### Enrollments

Tables 4 to 10 deal with enrollments at the schools of forestry.

Table 4 shows the enrollments by classes at each school for the fall term of 1950-1951.

Table 5 lists the totals of undergraduate enrollments at all schools for each of the years 1903-1904 to 1950-1951.

Table 6 presents the undergraduate enrollments by classes at all schools for each of the years 1933-1934 to 1950-1951. It also shows the increases or decreases by years for each of the four undergraduate classes.

Table 7 lists for all schools for each of the years 1931-1932 to 1950-1951 the total numbers of men registered as candidates for the master's and doctor's degrees.

Table 8 gives the enrollments at each school for the fall term 1950-1951, classifying undergraduates and graduates into veteran and nonveteran groups. It also shows

TABLE 4.—ENROLLMENTS BY CLASSES AT SCHOOLS OF FORESTRY IN THE UNITED STATES FOR THE FALL TERM 1950-1951

| | Fresh-men | Sopho-mores | Juniors | Seniors | Total under-graduates | Graduates Master's | Graduates Doctor's |
|---|---|---|---|---|---|---|---|
| Accredited schools | | | | | | | |
| 1. California | 19 | 59 | 81 | 62 | 221 | 25 | 7 |
| 2. Colorado | .... | 42 | 95 | 35 | 172 | 19 | .... |
| 3. Duke | .... | .... | .... | .... | .... | 65 | 11 |
| 4. Florida | 50 | 50 | 48 | 36 | 184 | 11 | .... |
| 5. Georgia | 29 | 32 | 44 | 65 | 170 | 4 | .... |
| 6. Idaho | 66 | 62 | 39 | 53 | 220 | 15 | .... |
| 7. Iowa | 52 | 51 | 53 | 80 | 236 | 6 | 1 |
| 8. Louisiana | 26 | 22 | 28 | 45 | 121 | 8 | .... |
| 9. Maine | 86 | 60 | 32 | 58 | 236 | 4 | .... |
| 10. Michigan Univ. | 24 | 50 | 60 | 96 | 230 | 60 | 25 |
| 11. Michigan State | 63 | 56 | 57 | 135 | 311 | 38 | 9 |
| 12. Minnesota | 62 | 78 | 53 | 82 | 275 | 12 | 11 |
| 13. Montana | 52 | 62 | 48 | 83 | 245 | 8 | .... |
| 14. New York | 188 | 162 | 153 | 175 | 678 | 86 | 32 |
| 15. North Carolina | 68 | 37 | 35 | 55 | 195 | 12 | .... |
| 16. Oregon | 73 | 94 | 64 | 75 | 306 | 12 | .... |
| 17. Pennsylvania | 100 | 84 | 79 | 95 | 358 | 16 | .... |
| 18. Purdue | 50 | 37 | 53 | 62 | 202 | 3 | .... |
| 19. Utah | 50 | 46 | 65 | 62 | 223 | 25 | 1 |
| 20. Washington Univ. | 52 | 55 | 56 | 80 | 243 | 14 | 7 |
| 21. West Virginia | 43 | 52 | 35 | 48 | 178 | .... | .... |
| 22. Yale | .... | .... | .... | 3 | 3 | 38 | 14 |
| Total | 1,153 | 1,191 | 1,178 | 1,485 | 5,007 | 481 | 118 |
| Nonaccredited schools | | | | | | | |
| 1. Alabama | 30 | 19 | 17 | 47 | 113 | .... | .... |
| 2. Connecticut | 23 | 14 | 23 | 15 | 75 | .... | .... |
| 3. Harvard | .... | .... | .... | .... | .... | 1 | .... |
| 4. La. Polytechnic | 25 | 17 | 21 | 25 | 88 | .... | .... |
| 5. Massachusetts | 17 | 7 | 9 | 8 | 41 | .... | .... |
| 6. Michigan Mining | 34 | 30 | 32 | 23 | 119 | .... | .... |
| 7. Missouri | 42 | 21 | 22 | 32 | 117 | 1 | .... |
| 8. New Hampshire | 23 | 15 | 20 | 20 | 78 | .... | .... |
| 9. Oklahoma | 42 | 32 | 30 | 31 | 135 | .... | .... |
| 10. Tennessee | .... | .... | 1 | 5 | 6 | .... | .... |
| 11. Texas | 29 | 16 | 12 | 12 | 69 | .... | .... |
| 12. Wash. State | 24 | 17 | 19 | 27 | 87 | .... | .... |
| Total | 289 | 188 | 206 | 245 | 928 | 2 | .... |
| Grand total | 1,442 | 1,379 | 1,384 | 1,730 | 5,935 | 483 | 118 |

TABLE 5.—UNDERGRADUATE ENROLLMENTS AT SCHOOLS OF FORESTRY IN THE UNITED STATES, 1903-1904 TO 1950-1951

| Year | Enroll-ments | Year | Enroll-ments |
|---|---|---|---|
| 1903-1904 | 19 | 1927-1928 | 1,957 |
| 1904-1905 | 39 | 1928-1929 | 2,079 |
| 1905-1906 | 51 | 1929-1930 | 2,123 |
| 1906-1907 | 98 | 1930-1931 | 2,120 |
| 1907-1908 | 143 | 1931-1932 | 2,573 |
| 1908-1909 | 258 | 1932-1933 | 2,388 |
| 1909-1910 | 357 | 1933-1934 | 2,246 |
| 1910-1911 | 518 | 1934-1935 | 3,791 |
| 1911-1912 | 591 | 1935-1936 | 5,406 |
| 1912-1913 | 637 | 1936-1937 | 6,032 |
| 1913-1914 | 868 | 1937-1938 | 6,067 |
| 1914-1915 | 904 | 1938-1939 | 5,144 |
| 1915-1916 | 944 | 1939-1940 | 4,487 |
| 1916-1917 | 897 | 1940-1941 | 3,763 |
| 1917-1918 | 560 | 1941-1942 | 2,881 |
| 1918-1919 | 498 | 1942-1943 | 2,326 |
| 1919-1920 | 927 | 1943-1944 | 503 |
| 1920-1921 | 1,092 | 1944-1945 | 571 |
| 1921-1922 | 1,363 | 1945-1946 | 1,473 |
| 1922-1923 | 1,347 | 1946-1947 | 7,010 |
| 1923-1924 | 1,439 | 1947-1948 | 7,454 |
| 1924-1925 | 1,624 | 1948-1949 | 8,212 |
| 1925-1926 | 1,771 | 1949-1950 | 7,469 |
| 1926-1927 | 1,880 | 1950-1951 | 5,935 |

the total enrollments classified by men and women.

Tables 9 and 10 present further information dealing with veteran and nonveteran enrollments.

In the tables dealing with enrollments, special students are excluded. The data dealing with special students are not complete; from the information contained on the questionnaire forms, apparently very few schools admit students in this category.

The total undergraduate enrollment reached its peak two years ago in 1948-1949 when 8,212 students were enrolled. From that peak the total dropped 743 to 7,469 last year. For the current year a further decrease to 5,935 has occurred, this being a drop of 1,534 from the 1949-1950 figure.

This decrease was foreseen last year when a total undergraduate enrollment of some 6,000 was predicted. From present statistics and trends, the undergraduate enrollments will be still lower next year, somewhere between 5,000 and 5,500. Of course a national emergency would make these estimates meaningless.

The New York State Ranger School reports 63 men registered for the year 1950-1951.

### Enrollments by Classes

The enrollment in the senior class is 1,730 a decrease of 771 from the all-time peak of 2,501 reported last year. For each of the five previous years the enrollments in the senior class had shown successive increases, but reference to Table 6 will show that a large decrease was certain this year. With 1,384 currently registered in the junior class, a further decline to some 1,300 may be expected next year. Although the number reported for this year is considerably below that of last year, the current figure of 1,730 is higher than that ever reported for any year except for 1949-1950.

The 3 seniors reported from Yale are presumably seniors in Yale College, enrolled in plant science with a forestry major and taking the work which integrates into the curricula of the Yale School of Forestry.

The enrollment in the junior class is 1,384, a decrease of 432 from the 1,816 of last year. This is the second year in which the enrollments have decreased from the peak of 2,497 in 1948-1949. Next year's enrollment in this class should be approximately the same as it is this year.

For the third successive year a drop has taken place in enrollments of the sophomore class. The high mark of 2,878 occurred in 1947-1948. This year's figure of 1,379 is 288 lower than the 1,667 of 1949-1950. The enrollment for 1950-1951 should be approximately 1,300.

This freshman class is reported at 1,442. Although this is the fourth successive year that decreases have been reported, it may be significant that the drop from last year is only 43. Reference to Table 6 will show that the decreases were 1,550, 210, 366, and, as noted for this year, 68. It may be that the registration in this class is becoming more or less stabilized. It is impossible to say, but there is some evidence for such an assumption. If the freshman class next

TABLE 6.—UNDERGRADUATE FALL-TERM ENROLLMENTS BY CLASSES IN SCHOOLS OF FORESTRY IN THE UNITED STATES FOR THE YEARS 1933-1934 TO 1950-1951

| Academic years | —Freshmen— Enrollment | Change | —Sophomores— Enrollment | Change | —Juniors— Enrollment | Change | —Seniors— Enrollment | Change | —Totals— Enrollment | Change |
|---|---|---|---|---|---|---|---|---|---|---|
| 1929-1933 averages | 773 | — | 597 | — | 476 | — | 398 | — | 2,244 | — |
| 1933-1934 | 783 | — | 628 | — | 467 | — | 368 | — | 2,246 | — |
| 1934-1935 | 1,751 | + 968 | 930 | + 302 | 671 | + 204 | 439 | + 71 | 3,791 | +1,545 |
| 1935-1936 | 2,301 | + 550 | 1,587 | + 657 | 943 | + 272 | 575 | + 136 | 5,406 | +1,615 |
| 1936-1937 | 2,044 | — 257 | 1,771 | + 184 | 1,402 | + 459 | 815 | + 240 | 6,032 | + 626 |
| 1937-1938 | 1,919 | — 125 | 1,656 | — 115 | 1,378 | — 24 | 1,114 | + 299 | 6,067 | + 35 |
| 1938-1939 | 1,403 | — 516 | 1,235 | — 421 | 1,294 | — 84 | 1,212 | + 98 | 5,144 | — 923 |
| 1939-1940 | 1,259 | — 144 | 1,095 | — 140 | 922 | — 302 | 1,141 | — 71 | 4,487 | — 657 |
| 1940-1941 | 1,000 | — 259 | 975 | — 120 | 857 | — 135 | 931 | — 210 | 3,763 | — 724 |
| 1941-1942 | 771 | — 229 | 672 | — 303 | 709 | — 148 | 729 | — 202 | 2,881 | — 882 |
| 1942-1943 | 845 | + 74 | 580 | — 92 | 404 | — 305 | 497 | — 232 | 2,326 | — 555 |
| 1943-1944 | 199 | — 646 | 94 | — 486 | 101 | — 303 | 109 | — 388 | 503 | —1,823 |
| 1944-1945 | 321 | + 122 | 114 | + 20 | 64 | — 37 | 72 | — 37 | 571 | + 68 |
| 1945-1946 | 840 | + 519 | 315 | + 201 | 205 | + 141 | 113 | + 41 | 1,473 | + 902 |
| 1946-1947 | 3,611 | +2,771 | 1,840 | +1,525 | 914 | + 709 | 645 | + 532 | 7,010 | +5,537 |
| 1947-1948 | 2,061 | —1,550 | 2,878 | +1,038 | 1,577 | + 663 | 938 | + 293 | 7,454 | + 444 |
| 1948-1949 | 1,851 | — 210 | 2,178 | — 700 | 2,497 | + 920 | 1,686 | + 748 | 8,212 | + 758 |
| 1949-1950 | 1,485 | — 366 | 1,667 | — 511 | 1,816 | — 681 | 2,501 | + 815 | 7,469 | — 743 |
| 1950-1951 | 1,442 | — 43 | 1,379 | — 288 | 1,384 | — 432 | 1,730 | — 771 | 5,935 | —1,534 |

year is approximately the same as for this one, the enrollments in each of the four undergraduate classes will be approximately the same, a somewhat unusual situation.

The statistics of freshman enrollments are never too satisfactory. Some schools, for example California, Colorado, and the University of Michigan, usually report only limited numbers of first year men or none at all. Also a few schools report only limited numbers of sophomores. However, the same schools each year follow the same policies of reporting freshmen and sophomores, and for comparisons with the data for previous years the tables are satisfactory.

Nine women were enrolled, 7 undergraduates and 2 graduate students. Of the 7 undergraduates, 2 were freshmen, one each at Minnesota and Washington, one was a junior at Montana, and 4 were seniors, one each at Colorado, the University of Michigan, the New York State College of Forestry, and Purdue. The 2 graduate students were reported by the New York State College of Forestry; one is a candidate for the master's degree, one for the doctorate.

### Graduate Enrollments

Candidates for the master's degree total currently 483, for the doctor's degree 118. Both these figures exceed the comparable ones for 1949-1950, the respective figures for that year being 450 and 98. As shown in Table 7, the figures for 1950 are higher than for any other year, but there is nothing abnormal in this situation. It was to be expected that the large numbers completing undergraduate work would bring about a reasonable increase in graduate candidates. Also as the schools of forestry mature in their academic development, graduate study will and should occupy a continuously more important place in their activities.

With the exception of West Virginia all the accredited schools report candidates for the master's degree. A small number have the majority of these students. The New York State College of Forestry leads with 86, Duke is second with 65, and the University of Michigan is third with 60. Michigan State and Yale each report 38, and California and Utah each list 25. At these 7 schools are 337 candidates for master's degrees, 70 percent of the total reported by all schools. All but 2 of the total number of 483 are at the 22 accredited schools.

Enrolled for the doctor's degree are 118 candidates at 10 schools. The New York State College of Forestry leads with 32, the University of Michigan being next with 25. Yale with 14, Duke and Minnesota with 11 each, Michigan State with 9, California and the University of Washington with 7 each, and Iowa and Utah with one each completes this list of schools.

TABLE 7.—FALL TERM ENROLLMENT OF GRADUATE STUDENTS IN SCHOOLS OF FORESTRY IN THE UNITED STATES FOR THE YEARS 1931-1932 TO 1950-1951

| | Master's | Doctor's | Total |
|---|---|---|---|
| 1931-1932 | 173 | 26 | 199 |
| 1932-1933 | 174 | 32 | 206 |
| 1933-1934 | 80 | 37 | 117 |
| 1934-1935 | 104 | 18 | 122 |
| 1935-1936 | 114 | 25 | 139 |
| 1936-1937 | 151 | 28 | 179 |
| 1937-1938 | 150 | 34 | 184 |
| 1938-1939 | 253 | 40 | 293 |
| 1939-1940 | 213 | 34 | 247 |
| 1940-1941 | 212 | 39 | 251 |
| 1941-1942 | 137 | 45 | 182 |
| 1942-1943 | 30 | 24 | 54 |
| 1943-1944 | 30 | 7 | 37 |
| 1944-1945 | 20 | 10 | 30 |
| 1945-1946 | 108 | 16 | 124 |
| 1946-1947 | 376 | 49 | 425 |
| 1947-1948 | 339 | 80 | 419 |
| 1948-1949 | 330 | 93 | 423 |
| 1949-1950 | 450 | 98 | 548 |
| 1950-1951 | 483 | 118 | 601 |

### Enrollment of Veterans

For the year 1950-1951 a total of 6,536 men and women was engaged in studies at the schools of forestry. Of this total 5,935, 91 percent were undergraduates; and 601, 9 percent graduate students. These percentages show a slightly higher proportion of graduate students than was the case in either of the past two years. In 1948-1949, 5 percent were graduate students; in 1949-1950, 7 percent.

Of the 5,935 undergraduates 2,544 or 43 percent are veterans. Three years ago 80 percent of the undergraduates were veterans; two years ago the figure was 75 percent, and last year 61 percent.

In the freshman class only 16

percent are veterans; 35 percent of the sophomores, 50 percent of the juniors and 65 percent of the seniors are reported as ex-service men. The comparable percentages in 1949-1950 were 28, 52, 68, and 80. In only the present senior class do veterans make up more than 50 percent of the enrollment.

In the group registered as graduate students the percentage of veterans still continues high, but lower than last year. Of the 601 graduate students, 74 percent are veterans as compared to 82 percent last year. Of the 483 registered for master's degrees, 369 or 76 percent are veterans; last year 83 percent in this group were service men. Of the 118 registered for doctorates, 78 or 66 percent are in the veteran group; the comparable figure last year was 80 percent.

These figures are presented in Tables 8, 9, and 10. Table 9 shows for each of the undergraduate and graduate groups the breakdown by veterans and nonveterans for each of the past three years. With one exception, (graduate students in 1949-1950), the trends as shown by percentages show a steady decrease in veteran enrollments. This will continue for a brief period in any event.

### L'Envoi

This is the final article dealing with statistics from schools of forestry that will be prepared by this writer. For the past 17 years he has collected the data from the schools, brought them into tabular form, and presented the material annually in the JOURNAL.

The idea of making this annual presentation arose after the completion of the Forest Education Inquiry. During that study a rather large amount of time was spent in obtaining the figures dealing with past enrollments and numbers of men graduated. Once the data through 1932 had been brought together and recorded in print, it seemed to the writer that there were several urgent reasons for assembling in the future the comparable statistics year by year. Executives of the forestry schools would naturally like to know the number of men currently enrolled at and graduated from the schools. College and university administrators would have more than an academic interest in these trends. Many foresters not in educational work had expressed their hope that an effort would be made to collect and publish the statistics. And then it seemed probable that in years to come another broad study of education in forestry might be undertaken.

With these thoughts in mind, the writer volunteered to start a system of collecting and publishing annually the salient figures of enrollments and degrees awarded. The forestry school executives gave their hearty approval to the suggestion and in 1934 the start was made. The first questionnaire was sent in 1934, but called for data for each of the years 1933 and 1934. Since 1935 the figures have been collected annually.

It has been an interesting study. In preparing the article each year the author has tried to present facts and not to editorialize. Once the statistics on a national basis were available the schools could then determine policies that seemed

TABLE 8.—ENROLLMENTS OF VETERANS AND NONVETERANS AT SCHOOLS OF FORESTRY IN THE UNITED STATES FOR FALL TERM 1950-1951
Special Students Excluded

| | Undergraduates | | Graduates | | Total | |
|---|---|---|---|---|---|---|
| | Veterans | Non-veterans | Veterans | Non-veterans | Men | Women |
| Accredited schools | | | | | | |
| 1. California | 100 | 121 | 30 | 2 | 253 | .. |
| 2. Colorado | 99 | 73 | 15 | 4 | 190 | 1 |
| 3. Duke | .. | .. | 47 | 29 | 76 | .. |
| 4. Florida | 75 | 109 | 9 | 2 | 195 | .. |
| 5. Georgia | 82 | 88 | 4 | .. | 174 | .. |
| 6. Idaho | 75 | 145 | 15 | .. | 235 | .. |
| 7. Iowa | 77 | 159 | 7 | .. | 243 | .. |
| 8. Louisiana | 62 | 59 | 6 | 2 | 129 | .. |
| 9. Maine | 101 | 135 | 4 | .. | 240 | .. |
| 10. Michigan University | 136 | 94 | 56 | 29 | 314 | 1 |
| 11. Michigan State | 160 | 151 | 35 | 12 | 358 | .. |
| 12. Minnesota | 110 | 165 | 20 | 3 | 297 | 1 |
| 13. Montana | 135 | 110 | 7 | 1 | 252 | 1 |
| 14. New York | 202 | 476 | 89 | 29 | 793 | 3 |
| 15. North Carolina | 91 | 104 | 9 | 3 | 207 | .. |
| 16. Oregon | 148 | 158 | 12 | .. | 318 | .. |
| 17. Pennsylvania | 132 | 226 | 13 | 3 | 374 | .. |
| 18. Purdue | 75 | 127 | 3 | .. | 204 | 1 |
| 19. Utah | 127 | 96 | 22 | 4 | 249 | .. |
| 20. Washington University | 105 | 138 | 7 | 14 | 263 | 1 |
| 21. West Virginia | 80 | 98 | .. | .. | 178 | .. |
| 22. Yale | .. | 3 | 36 | 16 | 55 | .. |
| Total | 2,172 | 2,835 | 446 | 153 | 5,597 | 9 |
| Nonaccredited schools | | | | | | |
| 1. Alabama | 34 | 79 | .. | .. | 113 | .. |
| 2. Connecticut | 44 | 31 | .. | .. | 75 | .. |
| 3. Harvard | .. | .. | 1 | .. | 1 | .. |
| 4. Louisiana Polytechnic | 38 | 50 | .. | .. | 88 | .. |
| 5. Massachusetts | 13 | 20 | .. | .. | 41 | .. |
| 6. Michigan Mining | 35 | 84 | .. | .. | 119 | .. |
| 7. Missouri | 46 | 71 | .. | 1 | 118 | .. |
| 8. New Hampshire | 34 | 44 | .. | .. | 78 | .. |
| 9. Oklahoma | 52 | 83 | .. | .. | 135 | .. |
| 10. Tennessee | 3 | 3 | .. | .. | 6 | .. |
| 11. Texas | 32 | 37 | .. | .. | 69 | .. |
| 12. Washington State | 41 | 46 | .. | .. | 87 | .. |
| Total | 372 | 556 | 1 | 1 | 930 | .. |
| Grand totals | 2,544 | 3,391 | 447 | 154 | 6,527 | 9 |

TABLE 9.—VETERAN AND NONVETERAN ENROLLMENTS CLASSIFIED BY UNDERGRADUATE AND GRADUATE GROUPS FOR YEARS 1948-1949 TO 1950-1951

| | 1948-1949 | | 1949-1950 | | 1950-1951 | |
|---|---|---|---|---|---|---|
| | *Number* | *Percent* | *Number* | *Percent* | *Number* | *Percent* |
| Undergraduates | 8,212 | 100 | 7,469 | 100 | 5,935 | 100 |
| Veterans | 6,199 | 75 | 4,591 | 61 | 2,544 | 43 |
| Nonveterans | 2,013 | 25 | 2,878 | 39 | 3,391 | 57 |
| Graduate students | 423 | 100 | 548 | 100 | 601 | 100 |
| Veterans | 325 | 77 | 450 | 82 | 447 | 74 |
| Nonveterans | 98 | 23 | 98 | 18 | 154 | 26 |

TABLE 10.—VETERANS AND NONVETERANS IN UNDERGRADUATE AND GRADUATE CLASSES 1950-1951

| | Veterans | | Nonveterans | | | Total |
|---|---|---|---|---|---|---|
| | | | Men | Women | | |
| | *Number* | *Percent* | *Number* | *Number* | *Percent* | |
| Freshmen | 237 | 16 | 1,203 | 2 | 84 | 1,442 |
| Sophomores | 485 | 35 | 894 | .. | 65 | 1,379 |
| Juniors | 692 | 50 | 691 | 1 | 50 | 1,384 |
| Seniors | 1,130 | 65 | 596 | 4 | 35 | 1,730 |
| | 2,544 | 43 | 3,384 | 7 | 57 | 5,935 |
| Masters | 369 | 76 | 113 | 1 | 24 | 483 |
| Doctors | 78 | 66 | 39 | 1 | 34 | 118 |
| Total | 2,991 | 46 | 3,536 | 9 | 54 | 6,536 |

advisable in the light of the overall situation.

A number of men in the schools, knowing that this was the writer's last presentation, have urged that these annual articles be continued. This situation has been brought to the attention of the Division of Education with the result that plans are being made for another to undertake the work so that the statistics for 1951 will appear in due time.

In assembling the data, the writer has used an extremely simple questionnaire form. This form has been sent soon after the opening of college to each forestry school. Most of the schools are prompt in returning the completed forms. Some, including a few of our better known schools, have been exceedingly lax; these schools have often held up the final compilation and the preparation of the papers for publication, often for a month or more. Actually the data requested should be in the office of every school executive enabling him to complete the forms easily and quickly, and making possible their return within a week or two at the latest.

In recent years, as soon as the statistics have come in, Tables 2 and 4, containing the basic data dealing with numbers of degrees awarded, and current enrollments, have been mimeographed and mailed immediately to the schools. Some three or four months elapse between the completion of the article and its appearance in the JOURNAL. By this procedure the schools have at the earliest possible date the current figures.

The tables have followed a uniform pattern which has facilitated a comparison year by year or for any two years at odd intervals. Possibly in the articles to be prepared by the next author, it will be desirable to alter the form of presentation and to furnish material in addition to that which has been heretofore included. A few of the men in the schools have suggested that the current figures be given for various fields of specialization. Frankly, it is questionable whether such a procedure is wise. If the questionnaire forms are too complex, some of them will never be returned. Moreover, the question of specialization is at times one of definition, and, if too many fields are listed, the data received will often be difficult to resolve satisfactorily. However, whoever takes over this work will obviously carry on in whatever way seems best to him.

This work is turned over to the new author with the hope that all schools will cooperate promptly and helpfully.

EDITOR'S NOTE—Gordon D. Marckworth, dean of the College of Forestry, University of Washington, Seattle, has consented to compile the statistics and prepare the annual article beginning with the year 1951.


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# Borders and Openings of Beech-Maple Woodlands in Southern Michigan

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BORDERS AND OPENINGS many times form a relatively large part of farm woodlands in southern Michigan. Composition, density, and form of vegetation in these areas often differ markedly from that of the closed interior portions of woodlands and surrounding fields. They are various phases of plant succession which foresters should consider in managing woodlands for both wood products and wildlife.

The purpose of this basic study is to describe in detail various aspects of border and opening communities, mainly the composition, size, distribution, and amount of cover of the component species, and to indicate successional trends.

Six separate farm woodlands were used in the study. All were located in Ingham County, Michigan, in an area from one-half to two miles south of East Lansing on the farm property of Michigan State College. Woodlands were approximately square or rectangular in shape and oriented along north-south- east-west axes. The size of the individual woodlands varied from 12 to 60 acres. A large part of the area in each woodland was covered completely by tree crowns; however, some cuttings of individual trees and tree groups had been made in the past. These woodlands had not been grazed for a long period of time.

Environmental conditions were similar throughout the area studied. The predominant cover type was beech-maple with a mixture of associated species such as white ash, basswood, black cherry, American elm, slippery elm, red oak, white oak, and tuliptree. The topography was generally undulating. Hillsdale sandy loam was the predominant soil type.

Plots were established and estimations of frequency and abundance of the vegetation by species and tree size-classes were made during the summer periods to aid in determining the composition and structure of the plant communities. Many observations without plot descriptions were also made. History and age of the openings and borders were determined from college records and interviews whenever possible, but in many cases had to be determined in the field from increment borings or from sections of the trees and shrubs and by the amount of stump deterioration.

## Woodland Borders

The term "woodland border" is used in this study to designate the portions of the woodlands which adjoin the surrounding farm land. The border area was found to be extremely variable and sometimes difficult to delimit because of gradual changes from field to woodland. Because it was desired to hold the scope of the study essentially to woodland environments, the border communities were limited to areas which were portions of the woodland-field transition zone occurring under or near the outer fringe of woodland trees, to areas untouched by farm machinery for farm animals, and to areas with a woodland type of shrub-herb ground cover or a dominant cover of intolerant shrubs.

### Methods

Only those borders which were formed by an ungrazed woodland and a farm pasture or grass field were considered. Four north- and two south-facing borders were studied. An attempt was also made to include various successional phases of border development. The total border area covered was approximately 2,000 feet in length which was divided into about equal portions in the six different woodlands.

Analysis of the vegetation was made by mechanically spaced sample plots. Two sizes of plots were used, a milacre for sampling tree seedlings (0 to 3 feet in height), vines, shrubs, and herbs, and a plot 2 milacres in size to sample all trees above the seedling class. Twenty-three plots of each size were placed on an average of of about one chain apart to give approximately a 20-percent sample for the large plots and a 10-percent sample for the small plots within a border area 6.6 feet wide.[1]

The amount of cover of plant species in the milacre plots was indicated by density classes used by Barick (*1*):

| Density classes | Part of milacre plot covered |
|---|---|
| T | 0-4 square feet |
| 1 | 4 square feet to ⅛ plot |
| 2 | ⅛ plot to ⅔ plot |
| 3 | ⅔ plot to entire plot |

For each plot, notes were made of the total amount of plot covered by vegetation and the extent of the border community into the stand. Nine transects 6.6 feet wide extending from the field borders into the woodland interiors were also made to analyze the extent of the border communities in greater detail.

In the 2-milacre plots, the number of each tree species was tallied by the following size classes:

| Size classes | Range in size |
|---|---|
| Saplings | 3 feet in height to 4 inches d.b.h. |
| Poles | 4 inches to 12 inches d.b.h. |
| Large (standards and veterans) | 12 inches and over d.b.h. |

[1]It was found that the number of sample plots for the borders, openings, and interiors was sufficient to give an adequate sample of the communities according to Cain's (*2*) species-area curve method.

All trees were tallied which formed a part of the cover of the plot regardless of whether the stems were in the plot area. In each plot, trees of all or part of these size classes made a 100 percent cover.

To provide a basis for comparison of both borders and openings to the vegetation of closed interior portions of the woodlots, an analysis of the vegetation was made in these latter areas in the same manner as for the border vegetation. Twenty-three milacre plots and the same number of 2-milacre plots were placed one chain from and perpendicular to each border plot.

TABLE 1.—FREQUENCY OF TREES SHADING WOODLOT BORDERS AND INTERIORS BY SIZE CLASSES

| Species | Borders[1] | | | Interiors[1] | | |
|---|---|---|---|---|---|---|
| | Saplings | Poles | Large | Saplings | Poles | Large |
| | *Percent* | | | *Percent* | | |
| Acer rubrum | | | 4 | | 4 | |
| Acer saccharum | 95 | 43 | 30 | 75 | 39 | 30 |
| Carya cordiformis | 13 | 4 | | 4 | | |
| Carya glabra | 13 | | | 4 | | |
| Crataegus sp. | 4 | | | | | |
| Fagus grandifolia | | | | 4 | 4 | 13 |
| Fraxinus americana | 39 | 4 | 9 | 9 | | 4 |
| Liriodendron tulipifera | | | 4 | | | |
| Ostrya virginiana | 30 | | | 17 | 9 | |
| Prunus serotina | 13 | 9 | | | 9 | |
| Prunus virginiana | 4 | | | 4 | | |
| Quercus alba | | | | | | 4 |
| Quercus borealis var. maxima | 4 | | 22 | 4 | | 4 |
| Sassafras variifolium | 17 | 9 | | | | |
| Tilia americana | 17 | | 9 | 4 | 4 | 9 |
| Ulmus americana | | 4 | 13 | | 4 | |
| Ulmus fulva | 17 | 9 | 4 | 13 | 22 | |

[1]Basis 23 .002 acre plots.

### Border Vegetation

*General characteristics.*—Fifty-nine plant species were recorded in the border plots. As indicated in Table 2, only a few of the species in the lower strata (tree seedlings, vines, shrubs, and herbs) were numerous enough in any one area to form a large amount of continuous cover. In general, the various species and individual stems were well scattered. An analysis of the plot data showed that the vegetation of the lower strata covered an average of 40 percent of the border area. The actual amount of cover varied considerably within the same woodlot and between different woodlots. Generally, the greater the amount of light available, the greater the cover. Sometimes this cover resulted from a large amount of leaf surface on relatively few stems, and in other cases it was composed of a large number of stems. The width and distinctiveness of the border communities were also variable. In some areas the composition and structure were about the same as that of the closed interiors. For about half the border plots, it was noted that the border communities, as defined mainly by the lower strata species, were approximately the width of the sample plots, 6.6 feet. For approximately the same number of other border plots, it was noted that the border communities extended from 10 to 35 feet into the interior of the woodland.

The composition of the upper strata of the border communities (saplings, poles, and larger sizes) was very similar to that of the interior of the stands studied (Table 1). One difference, however, was the presence of intolerant saplings of hawthorn (*Crataegus* spp.) and sassafras (*Sassafras variifolium*[2]) in the border community.

[2]Common and scientific names of the tree species are according to Harlow and Harrar (*3*); names of the vines, shrubs and herbs are according Gray's New Manual of Botany (*4*).

The structure of the upper strata of the border communities differed from that of the interior in two main ways. The number and frequency of saplings in the border area was much greater than in the interior although the number and frequency of poles and larger size classes was not greatly different. The portions of the crowns of the border trees exposed to light was much wider and longer than that of the same species and similar sizes in the stand interior. Most of the large interior trees had long,

FIG. 1.—An eastern red oak border tree showing the side branches with unrestricted development which cover the old field for about 30 feet. A few seedlings of white ash invaded the field beneath the overhang.

clear boles whereas border trees with unrestricted development sometimes had limbs 30 feet in length starting 12 to 15 feet from the ground (Fig. 1).

Because of variations in the past history of the borders studied, an analysis of the difference between north and south borders could not be made. There appeared to be no outstanding differences.

*Plant succession trends.*—One of the best indications of the general trend of border development was found on the north-facing edge of an all-aged, well-stocked stand and an adjoining field which had been untouched for many years. Figure 2 illustrates a part of the general structure of the wooded border area which now exists beyond the old fence that still marks the boundary of the large trees. The well-developed over-hang of side branches which had formed the original edge was still present when the observations were made, but was disintegrating. Near the outer edge of this over-hang was a narrow, well-stocked pole and sapling stand of sugar maple 8 to 12 feet in width. The area between the old border trees and the pole stand was from about 7 feet to 20 feet and generally almost free of vegetation. Beyond the pole and sapling stand was a shrub community composed mainly of brambles (*Rubus* spp.) 10 to 20 feet in width which merged with an outer herb community of grasses and golden rod (*Solidago* spp.).

From these observations and from those of other borders, the trend of succession appeared to be as follows (starting with a fully stocked wooded border and a grass field or pasture). First, the development of the side branches of the border trees takes place so that a cover is formed over the edge of the field, sometimes for a distance of 30 feet. Grasses become sparse, and small herbs, vines, and tree seedlings become scattered throughout the shaded area. The litter layer also becomes a prominent soil cover. If the over-hanging side branches are low (from 1 to 15 feet in height), the development of vegetation directly beneath is inhibited. Tolerant species, such as sugar maple (*Acer saccharum*), however, become established near and under the outer edge to form a narrow even-aged stand. With a higher or less dense over-hang, sugar maple and sometimes less tolerant trees may become established closer to the large border trees. At the junction of the edge of the outer small maple community and the field grass community in an area exposed to open sky, environmental conditions are apparently generally favorable for the development of a dense bramble community. As the outer side branches of the even-aged sugar maple community develop over the bramble, it is eliminated by overhead shading.

The more dense and complete the over-hanging side branches, the more definite the various community boundaries. In one selectively cut woodland where the border trees were not large or well-developed, zonation of tree saplings was not well defined; they were spread rather evenly from the seed tree to the outer shrub community.

FIG. 2.—A section of an old woodland border showing the large trees and the old fence. The outer limbs of these trees formed a dense canopy toward the old field area. Note the small even-aged tree stand near the outer portion of the overhang and the bare area between this and the large trees.

## Woodland Openings

The term "opening" refers to areas within forest stands exposed to open sky which are the result of a cutting or windfall of one or more standing trees. All sizes of openings which occurred were studied; 15 which were measured in detail and plotted are in the size classes shown in Table 3. Extensive observations were made also in other openings up to 2 acres in size. Most openings were small, however, and fell within the range indicated in Table 3. The time elapsed after the formation of the openings varied from 3 months to about 20 years.

### Methods

Almost all the openings which occurred in the six woodlands were included in this study. An intensive study was made of 23 openings in which the frequency and abundance of the plant species were determined in approximately the same manner as for the border plots; however, each opening was considered as a plot and the measurements of frequency and abund-

TABLE 2.—FREQUENCY BY COVER CLASSES OF TREE SEEDLINGS, VINES, SHRUBS, AND HERBS IN WOODLOT BORDERS, OPENINGS, AND INTERIORS

Basis: Borders—23 milacre plots; Interiors—23 milacre plots; Openings—23 openings (variable sizes)

| Species | Borders[1] | | | | Openings[2] | | | | Interiors[1] | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | T | 1 | 2 | 3 | T | 1 | 2 | 3 | T | 1 | 2 | 3 |
| | *Percent* | | | | *Percent* | | | | *Percent* | | | |
| *Tree seedlings* | | | | | | | | | | | | |
| Acer rubrum | | | | | | 4 | | | | | | |
| Acer saccharum | 65 | 4 | | | 56 | 4 | | 4 | 52 | 4 | | |
| Amelanchier oblongifolia | | | | | 4 | | | | | | | |
| Carya cordiformis | 26 | | | | 4 | | | | | | | |
| Carya glabra | | | | | 4 | | | | | | | |
| Crataegus spp. | 4 | | | 4 | | | | | | | | |
| Fagus grandifolia | | | | | 9 | | | | | | | |
| Fraxinus americana | 9 | | | | 39 | | 4 | | 9 | | | |
| Fraxinus pennsylvania var. lanceolata | 4 | | | | | | | | 13 | | | |
| Liriodendron tulipifera | | | | | 9 | | | | | | | |
| Ostrya virginiana | 9 | | | | 17 | 4 | | | | | | |
| Prunus serotina | 17 | | | | 43 | 4 | 4 | | | | | |
| Prunus virginiana | | | | | 4 | | | | 9 | | | |
| Quercus bicolor | | | | | 4 | | | | | | | |
| Quercus borealis var. maxima | 13 | | | | | | | | 4 | | | |
| Sassafras varifolium | 9 | 9 | | | 4 | | | | | | | |
| Tilia americana | 4 | 4 | | | 9 | 4 | | | | | | |
| Ulmus americana | | | | | 9 | | | | | | | |
| Ulmus fulva | 9 | 4 | | | 35 | 4 | 4 | | 17 | 4 | | |
| *Vines* | | | | | | | | | | | | |
| Celastrus scandens | | | | | 4 | | | | 4 | | | |
| Psedera quinquifolia | 22 | | | | 35 | | | | 22 | | | |
| Rhus toxicodendron | 13 | | | | 9 | | | | | | | |
| Smilax spp. | | | | | 9 | | | | 4 | | | |
| Solanum dulcamara | 4 | | | | | | | | | | | |
| Vitis bicolor | | | | | | 9 | | | | | | |
| Vitis cordifolia | 4 | | 4 | | 26 | 13 | 9 | 4 | | | | |
| *Shrubs* | | | | | | | | | | | | |
| Benzoin aestivale | | | | | 9 | | | | | | | |
| Evonymus obovatus | | | | | | | | | 9 | | | |
| Hamamelis virginiana | | | | | 9 | 4 | | | 4 | | | |
| Rhus typhina | 13 | | | | | | | | | | | |
| Ribes cynosbati | 9 | | | | 17 | | | | | | | |
| Rubus allegheniensis | 4 | | | | 43 | 9 | | | | | | |
| Rubus idaeus var. aculeatissimus | 9 | 4 | 4 | 4 | 22 | 4 | | | | | | |
| Rubus occidentalis | 4 | | | | 9 | 9 | | | | | | |
| Sambucus racemosa | 4 | | | | 30 | 13 | 26 | 26 | 4 | | | |
| Viburnum acerifolium | | | | | | | | | 4 | | | |
| Xanthoxylum americanum | 4 | | | | 4 | | | | 4 | | | |
| *Herb* | | | | | | | | | | | | |
| Actea alba | | | | | 4 | | | | | | | |
| Actea rubra | | | | | 17 | | | | | | | |
| Aralia racemosa | | | 9 | | 13 | | | | | | | |
| Arctium minus | | | | | 4 | | | | | | | |
| Arisaema triphyllum | 4 | | | | 9 | | | | 9 | | | |
| Carex spp. | 43 | 13 | 4 | | 4 | | | | 17 | | | 4 |
| Caulophyllum thalictroides | 9 | | | | | | | | | | | |
| Circea lutetiana | 9 | 9 | | | 52 | | | | 9 | | | |
| Cirsium lanceolatum | | | | | 4 | 4 | | 4 | | | | |
| Daucus carota | 4 | | | | | | | | | | | |
| Elymus villosus | 4 | | | | | | | | | | | |
| Erigeron sp. | | | | | 4 | | | | | | | |
| Galium aparine | 9 | | | | | | | | | | | |
| Galium circaezans | 17 | | | | | | | | | | | |
| Galium sp. | | | | | 9 | | | | | | | |
| Geranium maculatum | | | | | | 4 | | | 4 | | | |
| Geum canadense | 4 | | | | | | | | | | | |
| Hystrix patula | 26 | | | | | | | | 17 | 4 | | |
| Impatients biflora | | | | | 4 | | | | | | | |
| Lactuca canadensis | 4 | | | | 4 | | | | | | | |
| Leonurus cardiaca | 9 | | | | | | | | | | | |
| Maianthemum canadense | 4 | | | | | | | | | | | |
| Osmorrhiza claytoni | 13 | | | | 17 | | | | 22 | | | |
| Oxalis cymosa | 4 | | | | | | | | | | | |
| Parietaria pennsylvanica | 30 | | | | 4 | | | | 4 | | | |
| Phryma leptostachya | 4 | | | | 13 | | | | 4 | | | |
| Phytolacca decandra | | | | | 26 | 9 | | 4 | | 4 | | |
| Pilea pumila | 13 | | | | | | | | 4 | | | |

TABLE 2 (Continued)

| Species | Borders[1] | | | | Openings[1] | | | | Interiors[1] | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | T | 1 | 2 | 3 | T | 1 | 2 | 3 | T | 1 | 2 | 3 |
| | *Percent* | | | | *Percent* | | | | *Percent* | | | |
| Poa compressus | 4 | | | | | | | | | | | |
| Podophyllum peltatum | 4 | | | | | 4 | | | | | | |
| Polygonatum biflorum | 22 | | | | 17 | | | | 9 | | | |
| Polygonum virginianum | | | | | 22 | | | | | | | |
| Potentilla monspeliensis | 4 | | | | | | | | | | | |
| Sanguinaria canadensis | 13 | | | | 9 | | | | 13 | | | |
| Sanicula trifoliata | 9 | | | | 9 | 4 | | | 22 | | | |
| Smilacina racemosa | 26 | | | | | | | | 9 | | | |
| Solidago caesia | 9 | | | | | | | | | | | |
| Solidago sp. | | | | | 17 | | | | 4 | | | |
| Thalictrum dioicum | | | | | 4 | | | | | | | |
| Torilis anthriscus | 4 | 4 | | | | | | | | | | |
| Trillium grandiflorum | 4 | | | | | | | | | | | |
| Urtica gracilis | 4 | | | | 22 | | | | | | | |
| Verbascum sp. | | | | | 4 | | | | | | | |
| Viola canadensis | 4 | | | | | | | | | 4 | | |
| Viola sp. | 13 | 4 | | | 30 | 4 | | | 35 | | | |

[1]Basis: 23 milacre plots.
[2]Basis: 23 variable size plots.

ance were made on that basis. The cover class "T" was used to designate 0 to 10 percent cover. Observations and notes were made of 40 other openings but plots were not taken.

#### General Characteristics

In addition to variations in size and age, openings differed in composition and structure because of a diversity of past cutting practices, climatic influences, and species in the surrounding vegetation. Most of the openings were made by cuttings or windfalls of groups of one to ten trees.

Fifty-seven species which occurred in the openings are listed in Table 2. In general, the greatest number of species and individuals occurred during the first few years after the openings were made. With an increase in age, there was a general trend of change of dominance from herbs and shrubs, to shrubs, to trees, and a decrease in the number of species and individuals.

*Plant succession trend.* — In openings open for two growing seasons which resulted from the removal of one or two trees in areas where tree reproduction was sparse or missing, an herb-shrub community was usually dominant. One of the most common was a community dominated by common thistle (*Cirsium lanceolatum*), common poke (*Phytolacca decandra*), and red-berried elder (*Sambucus racemosa*). When a large amount of light was available, the cover was generally 100 percent and the three dominants often 6 feet in height. In smaller openings with a considerable amount of side shade, this type of cover was usually more sparse, or other species such as May apple (*Podophyllum peltatum*) or early meadow rue (*Thalictrum dioicum*) were the dominants of the ground cover.

In older openings, only slightly shaded by side tree crowns and with only a small amount of tree reproduction, shrubs were the dominant vegetation. It appeared that this change from the early herb-shrub community took place during a period of about 5 years. The most frequent dominant species was red-berried elder which also formed a larger percent of cover than any of the other species noted. Other common dominants were blackberry (*Rubus alleghensiensis*), black raspberry (*Rubus occidentalis*), and wild red raspberry (*Rubus idaeus* var. *aculeatissimus*). The elder formed an almost complete cover in some openings as shown in Figure 3 or it occurred with brambles to form a dense complete cover with small herbaceous species beneath and generally only a few tree seedlings.

One other prominent species group was the grape which was composed of two species in the area studied, *Vitis cordifolia* and *Vitis bicolor*. These were scattered in some of the openings and occasionally formed a large and complete cover as shown in Figure 4. This grape community apparently developed over a period of at least 8 years and from all indications in the field it would dominate the opening for 15 or more years because many young saplings which were in the opening before development of the grape were killed and no tree seedlings occurred beneath it. Similar observations were made in other openings.

Openings closed in two general ways. If they were relatively narrow, approximately 25 feet in diameter or less, and without tree reproduction at the time of cutting, the crowns of the surrounding tall trees often extended over the open area to form the closure. A second and more common method was by the development of crowns of small trees of seedling

TABLE 3.—DISTRIBUTION OF WOODLOT OPENING AREAS BY SIZE CLASSES

| Size classes of openings | Openings |
|---|---|
| *Acre* | *Number* |
| .001—.01 | 6 |
| .011—.02 | 5 |
| .03 —.05 | 2 |
| .06 —.1 | 2 |

FIG. 3.—A dense stand of red-berried elder in a one-tenth-acre opening which resulted from the windfall of six large trees approximately 7 years ago. The elder, which covered approximately 80 percent of the opening was 8 to 15 feet in height, with stem diameters ranging to 2¼ inches at 2 feet above the ground. *Geranium maculatum, Viola spp.* and *Aster spp.* occur beneath the shrub cover.

or sprout origin in or near the borders of the opening. Frequently a combination of the two methods occurred.

The time for the closure of openings by tree species varied considerably and depended mainly upon the size of the opening, the amount of tree reproduction remaining after the formation of the opening, subsequent seeding and sprouting, and the kind of shrub or herb community which developed after the opening was formed. In a large opening of 2 acres in which tree reproduction was abundant at the time of cutting, it was noted that within 4 years a large part of the area had a 50 to 100 percent cover of tree saplings, mainly slippery elm (*Ulmus fulva*) and sugar maple. In other portions of this area and in a smaller adjoining opening of the same age in which the reproduction at the time of cutting was not abundant, brambles formed 70 to 100 percent of the cover in small areas. In other openings of approximately the same age, red-berried elder was a tall species which by itself, or with scattered slippery elm sprouts, formed a thick, dominant cover.

Observations indicated that complete closure of many small or narrow openings took place within 7 to 10 years because of the growth of crowns of under-story or over-story trees. With complete closure, the light-demanding shrubs such as red-berried elder, brambles, and grape were eliminated.

Other observations indicated that where tree crowns did not cover the bramble or elder communities, these communities could persist for at least 10 years or longer. There was also every indication that dense grape communities in relatively large openings could remain dominant for at least 15 years. By 20 years, however, it appeared that most openings, both large and small, were completely closed by tree crowns. In large, recently closed openings, the dominants were generally a combination of the following: slippery elm, white ash (*Fraxinus americana*), basswood (*Tilia americana*), black cherry (*Prunus serotina*), and bitternut hickory (*Carya cordiformis*). In small openings these species were often present, or sugar maple formed a large part of the cover. Smith (5) observed

FIG. 4.—A complete cover of grape vines in a .05-acre opening which resulted from the cutting of two large trees 18 years previously and a windfall 10 years later. No vegetation existed beneath the grape and only a few scattered species occurred along the border of the opening.

that the closure of cut unburned hardwood stands in northern Michigan was also practically completed within 20 years from hardwood sprouts and seedlings.

## Discussion

Some outstanding differences between the composition and structure of vegetation of borders and openings and interiors were noted. In the border areas, 59 different species were listed; 57 were listed in the openings. However, it was found that 49 species were not common to both areas. Part of this difference may have been caused by sampling and another part by environmental conditions. All the borders were formed by closed tree over-story canopies which caused shading of the ground surface and a leaf litter layer. Only a few intolerant species were found in these areas. It was only in the shrub border communities beyond the extent of the upper tree canopies that intolerant species were found in large numbers. On the other hand, in most openings, intolerant shrubs were generally the dominants.

Table 2 shows that more individuals form a relatively large amount of cover in openings than in borders. The majority of openings had from 90 to 100 percent cover of lower strata vegetation; borders had a 40 percent cover.

A statistical analysis of the plot data brought out other differences and similarities. The average number of lower strata species per plot was largest in the openings, slightly smaller in the borders, and smallest in the interiors. An analysis of variance to test the significance of these relationships for the milacre plots and openings showed a significant difference between borders and interiors, between openings and interiors, but not between openings and borders. A similar significant difference was also found for the 2-milacre plots of the borders and interiors. T-tests of the variation in kinds of species by plots in comparison with a selected plot in each area resulted in the same type of relationship between areas.

Only 40 species were recorded from interior plots and only two of these did not occur in borders or openings. From Table 2, it can be seen also that the frequency of the ground cover species and the amount of cover is much less than in border and opening areas. In fact, in many interior areas the lower strata vegetation was completely lacking; the average amount of cover was 16 percent. The larger tree strata formed a 100-percent cover over most of the wooded interiors outside of the openings.

## Summary

An ecological study of the borders and openings of six different beech-maple woodlands near East Lansing, Michigan was made during two summer seasons.

### Woodland Borders

The structure and composition of the border areas was extremely variable; many types of transition communities from field to woodland conditions were noted. This study was limited essentially to woodland conditions.

In an analysis of both north- and south-facing borders, 59 species of plants were listed. Vegetation of the lower strata covered an average of 40 percent of the border sample areas which were variable in the amount of cover per unit area. All borders were completely covered by crowns of trees of larger sizes which developed long, wide, dense crowns on the sides facing the borders.

The gradual extension of the woodland border into the field areas was evidenced by the development of a relatively narrow even-aged tree stand near the outer portion of the overhanging side branches of the large border trees and a narrow bramble community between the trees and the field grass community.

### Woodland Openings

Openings were areas within the forest stands exposed to open sky. In this study these openings were generally small, ranging from approximately a milacre to one-tenth acre.

Fifty-seven species were recorded in the openings. The greatest number occurred during the first few years after the opening was made.

In openings in which tree seedlings or sprouts were absent after the formation of the openings, the successional trend was generally initiated by an herb-shrub community in which the shrubs later became dominant; tree species were the final dominant cover.

Openings closed by the extension of the crowns of trees on the sides of the openings or by the development of crowns of seedlings and sprouts within the openings. Time for closure varied from about 4 to 20 years depending upon the size of the opening and the species which became established in or near it.

The total number of species and amount of cover of the vegetation of borders and openings were greater than those of the interiors; differences statistically significant were the number of species per plot and number of additional kinds of species per plot in relation to a selected plot.

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# Lophodermium pinastri and Needle Browning of Southern Pines[1]

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NEEDLE BROWNING of pines is often widespread in the southeastern United States. The term "needle browning" is employed herein to describe the sudden dying back and browning of needles in contrast to the gradual death of old needles before seasonal shedding. Pines of all ages and of different species are involved, and the occurrence of numerous affected trees in extensive stands often presents an alarming appearance. This disease is thus a matter of concern to the forest manager.

In the spring of 1949 in the coastal plain areas of northern Florida, Georgia, and South Carolina, longleaf pine (*Pinus palustris* Mill.) was relatively free from needle browning, except for that caused by the brown spot fungus (*Scirrhia acicola* (Dearn.) Siggers) on seedlings in the grass stage. Loblolly pines (*P. taeda* L.) and slash pines (*P. caribaea* More.) were commonly affected, however, and needle browning was particularly severe on pond pine (*P. rigida serotina* (Michx.) Loud.).

Three fungi were regularly associated with most diseased needles. *Hypoderma lethale* Dearn. was commonly present by itself on pond and slash pine needles and, to a lesser extent, on loblolly pine needles. *Lophodermium pinastri* (Schrad.) Chev. occupied mostly the tips of loblolly pine needles along with *S. acicola*.

In the fall of 1949 a dying back of the current needles of loblolly pines was prevalent in the piedmont section of North Carolina, in addition to the coastal plain areas of South Carolina and northeastern Georgia. Fructifications of *S. acicola* and *L. pinastri* were evident on many of the diseased needles. *H. lethale* was again collected on the diseased foliage of slash pines in central and southern Georgia in the early spring of 1950.

It would be desirable to know the pathological importance of each of these fungi associated with needle browning. However, the present study was necessarily confined to one of them, *L. pinastri*, particularly as it occurs in the Duke forest at Durham, N. C. It has been collected on the foliage of planted longleaf and slash pines, red pine (*P. resinosa* Sol.), and eastern white pine (*P. strobus* L.) in the Duke forest. In addition, it has been collected on loblolly and shortleaf pines (*P. echinata* Mill.) in natural stands.

*L. pinastri* is known to occur on 26 species and varieties of pines and has been found on the continents of Africa, Asia, Europe, North America, and Oceania (*2*). It is regarded as a pathogen in Europe where it has been extensively investigated (*3*, *4*, *6*, *7*, and *16*). It appears to be of general occurrence in this country, especially on fallen pine needles. Notwithstanding, there have been only a few reports of its pathogenicity to pines in the United States (*1*, *13*, *15*, and *19*), and there have been no critical American studies of its relationship to pine needle diseases.

## Field Observations

This fungus is among those Ascomycetes which form black, elongate fructifications on pine needles. When mature, these hysterothecia open by means of slits, during wet weather, to discharge forcibly needle-shaped ascospores. Air-borne ascospores are the only means known by which *L. pinastri* spreads to other pine needles. The amount of inoculum is thus primarily dependent upon the degree of fruiting.

*Fruiting of Lophodermium pinastri on attached needles.*—Beginning in mid-April 1949, biweekly observations were made of pines in the Duke forest that showed evidence of needle browning resulting from causes other than *L. pinastri*. Yet many hysterothecia became mature on the attached diseased needles during the last week of July and the first week in August. Later in the summer occasional full-grown needles of the current season were killed by insects. Ripe fructifications were evident on many of them by mid-October, which indicates a probable lapse of two or three months from the invasion of the dead needles until subsequent ascospore production. Current loblolly pine needles, which were killed by the brown spot fungus in late summer, bore numerous mature hysterothecia of *L. pinastri* in November. At all times of the year some ripe fructifications were collected on persistent diseased needles.

*Fruiting of Lophodermium pinastri on fallen needles.*—*L. pinastri* is so common on fallen needles in most pine stands that most of the inoculum probably comes from them. The number of hysterothecia on fallen needles within three stands was sampled biweekly from July 15, 1949 to May 1, 1950. One hundred needles were examined for the presence of hysterothecia each time by selecting them at random from all undecomposed needles lying within a one-foot-square area in each stand. This square was chosen by chance from 36 similar squares in a permanent six-foot-square plot within each stand. The hysterothecia were

[1] From a dissertation submitted in partial fulfillment of the requirements for the degree of Doctor of Philosophy in the Graduate School of Arts and Sciences, Duke University, Durham, N. C. The author is most appreciative of the help given by Dr. F. A. Wolf, under whom this study was made. Thanks are also due Dr. G. H. Hepting of the Division of Forest Pathology, Bureau of Plant Industry, Soils, and Agricultural Engineering, U. S. Department of Agriculture, for aid and advice. The Divison of Forest Pathology and the Union Bag and Paper Corporation, Savannah, Ga., aided in the collection of diseased material.

moistened and placed on glass slides in moist chambers for 48 hours at room temperature.

The number of fructifications which discharged viable ascospores was recorded for each collection of needles. By this method it was determined that some mature hysterothecia were present throughout the year on fallen needles. However, ripe hysterothecia were especially numerous during July and August.

*Dissemination of spores.*—The population of air-borne ascospores under forest conditions was also sampled. A spore trap was placed in each of six pine stands. There was an abundance of fungus fruiting bodies on fallen needles in each stand. The traps consisted of housings made from tin cans which were fastened to the tops of poles. Glass slides were placed within them at a 45° angle to the ground at a height of four feet. The housings permitted free movement of air up through them while protecting the slides from rain. Counts were made at least once a week of the number of ascospores per square centimeter which had lodged on the slides.

Ascospores of *L. pinastri* possess a gelatinous material which enables them to adhere readily to glass surfaces. The greatest number of spores lodged on the slides during August, with somewhat fewer being present during July. The presence of occasional spores was noted in May, June, September, October, January, and March.

The following conclusions may be drawn from the observations: Some mature hysterothecia of *L. pinastri*, capable of discharging germinable ascospores, are present at all times of the year on dead needles and dead parts of living needles. Spore inoculum is thus essentially available whenever weather conditions permit spore discharge. Greater numbers of mature hysterothecia occur during the summer, both on attached needles and on fallen needles. There are more air-borne ascospores at this time, also. Since new needles of the southern pines elongate during spring and early summer *L. pinastri* ascospores must lodge on them.

## Laboratory Tests

*Cultures of diseased needles.*—From the beginning of needle growth in the spring of 1949 through the following spring, pine foliage was carefully examined for discolorations indicative of fungus attack. Discolored needles, or parts of them, were surface-sterilized by washing in a 1:1000 mercuric chloride solution for from two to five minutes. They were then rinsed in sterile distilled water and placed on 3-percent malt agar in Petri dishes. The plates were kept at room temperature for at least two weeks to permit the growth of fungi internal to the needles. As soon as hyphae appeared on the medium transfers to malt agar slants were made. Fortunately the fungi that were associated with needle discolorations fruited readily or produced characteristic mycelia on malt agar.

Since *L. pinastri* does not produce ascospores under these conditions, suspected isolates of it were compared with known cultures derived from ascospores. Positive determinations were later obtained, in most instances, when spermogonia of *L. pinastri* developed on sterilized pine needles which had been introduced into pure flask cultures of the isolates.

*L. pinastri* was isolated from a variety of discolorations on loblolly, shortleaf, and white pine needles. These discolorations consisted of yellow, dark green, and brown bands, purplish-brown to yellowish-brown irregular spots, and necrotic areas not more than one square millimeter in size, as well as dead tips of green needles. Other fungi, including *Dematium pullulans, Macrophoma* sp., *Nigrospora sphaerica, Pestalotia* sp., *Septoria* sp., *Sphaerella acicola, Sphaeropsis* sp., *Scirrhia acicola,* and *Xylaria* sp. were also isolated, although less frequently, from needle parts similar in appearance to those which yielded *L. pinastri.* The writer's interpretation is that even though *L. pinastri* was commonly associated with pine needle discolorations, its role as a pathogen cannot be inferred from this fact alone since it can occur as a saprophyte that quickly invades pine needle tissue killed from other causes.

*Spore germination studies.*—A knowledge of the conditions governing spore germination in the laboratory is often helpful for understanding the role and distribution of a fungus in nature. For purposes of these tests, a germinated spore was defined as one having a germ tube as long as the width of the ascospore. Hysterothecia on needles of the various pines in the Duke forest provided the test material.

The effects of temperature and relative humidity on ascospore germination were investigated using 0.01 milliliter drops of spore suspensions on glass slides. These suspensions were obtained by placing moistened hysterothecia over distilled water for from 12 to 24 hours in moist chambers. It was first determined that many ascospores germinated in a saturated atmosphere at a temperature of 22.5° C. within 12 to 24 hours after they were cast from fruiting bodies. It was also previously noted that numerous hysterothecia began to discharge spores 1 to 2 hours after they were moistened. Care was taken to insure that a representative sample of spores in suspension was placed on each slide within a series.

*Temperature relations.*—For the temperature tests a constant relative humidity of close to 100 percent was employed. This was obtained by placing the slides over distilled water in Petri dishes, supporting them on glass V-shaped rods. Dishes were maintained continuously at different temperatures by means of ovens, refrigerators, and "iceless refrigerators" (*5*). Percentage spore germination for the total spores in each drop of suspension was determined after 24 hours.

The results are presented in Table 1. Ten series of temperature tests are recorded. These represent eight separate collections of hys-

TABLE 1.—GERMINATION OF LOPHODERMIUM PINASTRI ASCOSPORES IN WATER DROPS AT DIFFERENT TEMPERATURES, DURING 24 HOURS[1]

| Temperature spores exposed to | Spores used | Spores germinated |
|---|---|---|
| *Degrees C.* | *Number* | *Percent* |
| 2.5 – 7.4 | 783 | 6 |
| 7.5 – 12.4 | 1297 | 5 |
| 12.5 – 17.4 | 1238 | 7 |
| 17.5 – 22.4 | 1187 | 24 |
| 22.5 – 27.4 | 2090 | 21 |
| 27.5 – 32.4 | 935 | 21 |
| 32.5 – 35.0 | 925 | 3 |

[1] The relation of percentage germination to temperature is statistically highly significant, as determined by the analysis of variance.

terothecia on pine needles from seven locations. The temperatures which most favored spore germination in 24 hours, those of about 20° to 30° C., are present at Durham, N. C., where the growing season is reported to be 201 days (*18*), for much of the year.

*Moisture relations.*—Spore suspension drops were permitted to dry on slides for about one hour at room temperature, for the relative humidity experiments. This did not impair spore germinability since it was previously determined that ascospores remained viable for at least 24 hours at room temperature.

The relative humidity test slides were suspended in 250 milliliter Erlenmeyer flasks, each of which contained 50 milliliters of a sulfuric acid solution made up to a given specific gravity to yield a desired relative humidity in a closed container (*14*). The flasks were kept at a constant temperature of 22.5° C.

After exposure of 24 hours the slides were removed from the flasks and counts of germinated spores were made. The same spores were then immediately put in a saturated atmosphere for an additional 24 hours, after which the percentage germination was again recorded. This latter step served to corroborate the presence of germinable spores which had not germinated at relative humidities below saturation.

Data presented in Table 2 were obtained from 23 test series using ascospores from 22 separate lots of hysterothecia collected in six locations. Percentage spore germination was more than twice as great at 98 percent relative humidity than at a relative humidity of 95 percent. The amount of germination was negligible at the lower relative humidities employed. It thus appears that humidities which approach saturation are necessary for ascospore germination in 24 hours at a favorable temperature.

## Pathogenicity Tests

Pathogenicity of *L. pinastri* was tested by applying ascospores of the fungus to needles of southern pines. The so-called "conidia" of *L. pinastri*, which the writer regards as spermatia, were not employed as inoculum inasmuch as neither Haack (*3*) nor the writer has been able to obtain their germination. In the ascospore inoculation experiments the pine test material consisted of one-year-old loblolly and pond pine seedlings and two-year-old longleaf, shortleaf, and slash pine seedlings. Five saplings each of loblolly and shortleaf pine were also included. The seedlings were transplanted to pots several months before inoculum was applied. All test plants were examined weekly until May 15, 1950.

Inoculum for the first test series on July 9, 1949, consisted of a distilled water suspension of freshly discharged ascospores from one collection of hysterothecia. The suspension concentration was adjusted to 300 spores per milliliter and one milliliter was sprayed onto the foliage of each of 21 loblolly pine seedlings. As a check, seven other loblolly pines were sprayed with one milliliter of distilled water each. All plants were then placed in a chamber having a saturated atmosphere.

One group of seven seedlings was removed after a period of 12 hours, a second group after 24 hours, and a third group along with the control seedlings after 48 hours. During this time the temperature within the chamber was between 21.5° and 23.5° C. The pines were then placed out-of-doors. Sixteen percent of the ascospores which lodged on glass slides placed behind the sprayed needles germinated in 48 hours in the same moist chamber.

TABLE 2.—GERMINATION OF LOPHODERMIUM PINASTRI ASCOSPORES, DURING 24 HOURS, IN DIFFERENT RELATIVE HUMIDITIES AT 22.5 DEGREES CENTIGRADE[1]

| Disposition of spores | Spores used | Spores germinated |
|---|---|---|
| | *Number* | *Percent* |
| Water | 4111 | 6.3 |
| Percent relative humidity | | |
| 98 | 1236 | 4.9 |
| 95 | 1353 | 1.9 |
| 90 | 1480 | 1.0 |
| 81 | 1426 | 0.4 |
| 70 | 1481 | 0.9 |
| 58 | 1362 | 0.4 |

[1] The relation of percentage germination to relative humidity is statistically highly significant, as determined by the analysis of variance.

For the remainder of the experiments, bundles of needles bearing mature hysterothecia were fastened to the pine foliage. Hysterothecia were first carefully selected and then randomized so that each bundle of inoculum for a test series contained about the same number of fruiting bodies capable of discharging viable ascospores.

In one experiment a bundle of inoculum was placed at the top of each of 20 loblolly pines and 10 pond pines so that spores were ejected onto the underlying needles. The seedlings were kept entirely out of doors, reliance being placed on rains to induce spore discharge. The inoculum was applied on September 27, and by December 5 most hysterothecia were empty.

The next experiments consisted of tying bundles of inoculum to twigs of five loblolly and five shortleaf pine saplings, 4 to 10 feet tall, which were growing in a clearing in the forest. Inoculum was fastened to both the oldest and the youngest needles on one branch each in the lower, middle, and upper crown of each sapling. The hysterothecia remained on the trees from October 21 until May 15 in close proximity to healthy needles.

The remainder of the tests were conducted in a greenhouse. Moistened, actively discharging fruiting bodies were placed at the tops

of seedlings. The number of mature hysterothecia in a random bundle was ascertained for each test series. Counts of fructifications that cast viable spores varied from 7 to 65 per bundle. This variation was due, in part, to the use of inoculum from a different source for each experiment. A one-half gallon fruit jar lined with wet paper toweling was then placed over each seedling for at least 72 hours to insure spore discharge and germination in an atmosphere close to 100 percent relative humidity. The pines were subsequently kept in the greenhouse. During the entire period of these experiments the greenhouse temperature was within the range of 15 to 26.5° C.

The first application of inoculum to the greenhouse pines was made on December 2, 1949. Inoculum was last applied on April 6, 1950. Ascospores were dichharged onto newly forming secondary needles, as well as onto mature needles of the previous season's growth. The new needles varied in length as follows: loblolly pine, 1.0–5.0 centimeters; longleaf pine, 1.6–6.2 centimeters; pond pine, 0.3–5.4 centimeters; slash pine, 1.0–2.8 centimeters; shortleaf pine, 0.8–1.9 centimeters.

The attempted greenhouse inoculations undoubtedly provided conditions suitable for spore germination. For example, in one series of tests four clean cover slips were fastened below the new secondary needles of four pine seedlings. After 72 hours, during which the plants were covered by the fruit jars, 11, 51, 397, and 124 ascospores per square centimeter had lodged on the cover slips and germinated. The longest germ tubes were 67, 75, 60, and 67 microns, respectively, nearly the length of the average ascospore.

Neither applications of *L. pinastri* ascospores to seedlings in the greenhouse nor to pines out of doors resulted in infections. The inoculation tests are summarized in Table 3. Inasmuch as many pines were subjected to viable ascospores from different collections of hysterothecia, under suitable conditions for spore germination, it is felt that if *L. pinastri* were pathogenic, symptoms of disease would have become noticeable during the time the seedlings were kept under observation.

TABLE 3.—SUMMARY OF TESTS OF PATHOGENICITY OF LOPHODERMIUM PINASTRI TO NEEDLES OF SOUTHERN PINES[1]

| Pine species | Plants used | | Source of inoculum |
|---|---|---|---|
| | Greenhouse | Outside | |
| | *Number* | *Number* | |
| *P. caribaea* | 1 | 0 | *P. caribaea* |
| | 14 | 0 | *P. echinata* |
| | 2 | 0 | *P. palustris* |
| | 11 | 1 | *P. taeda* |
| *P. echinata* | 10 | 0 | *P. echinata* |
| | 2 | 0 | *P. palustris* |
| | 0 | 5 | *P. resinosa* |
| | 3 | 0 | *P. taeda* |
| *P. palustris* | 11 | 0 | *P. echinata* |
| | 2 | 0 | *P. palustris* |
| | 5 | 0 | *P. taeda* |
| *P. rigida serotina* | 1 | 0 | *P. caribaea* |
| | 9 | 0 | *P. echinata* |
| | 0 | 10 | *P. resinosa* |
| | 11 | 0 | *P. taeda* |
| *P. taeda* | 2 | 0 | *P. caribaea* |
| | 14 | 21 | *P. echinata* |
| | 2 | 0 | *P. palustris* |
| | 0 | 25 | *P. resinosa* |
| | 16 | 0 | *P. taeda* |

[1] None of the inoculations resulted in infection.

## Discussion

Observations by Europeans on the biology of *L. pinastri* and those of the writer differ importantly only with regard to its pathogenicity. The fungus has been held accountable for much damage to young pines in Europe. On the other hand, as a result of the writer's field observations and pathogenicity tests, *L. pinastri* seems not to be pathogenic to pines growing in the southeastern United States, and it seems probable that it is not pathogenic to pines in North America. Manifestly, reciprocal inoculations that employ both European and American strains of the fungus as well as tree species native to both continents would have to be attempted to determine whether strain differences in pathogenicity of the fungus exist.

From a review of the literature it appears probable that some European workers have given insufficient reasons for ascribing pathogenicity to *L. pinastri*. For example, Schwappach (*12*) and Prantl (*10, 11*) named the fungus a cause of needle cast, largely because of the presence of its fruiting bodies on dead, previously diseased needles. Later, Lagerberg (*6*) in Sweden, and Hagem (*4*) in Norway, attributed needle casts of pines to *L. pinastri* as a result of finding its mycelium within dead parts of diseased needles and fructifications on them. The saprophytic nature of the fungus on fallen pine needles and its ability to invade quickly dead needle cells leads one to question these interpretations.

In the writer's opinion, the European pathogenicity tests (*3, 8, 9, 10, 16,* and *17*) were conducted without sufficient control over experimental conditions. Although positive results were claimed, there is the possibility that *L. pinastri* was not the primary cause of the observed disease symptoms. It is interesting that in North America the only previously reported infection tests of *L. pinastri* were those performed by Darker (*2*) in Canada. He obtained no evidence that the fungus is pathogenic even though his inoculations were attempted in a manner similar to that which resulted in pine needle infections by other hypodermataceous fungi.

Evidently, reports of the pathogenicity of *L. pinastri* in this country have been based entirely on the occurrence of its hystero-

thecia on dead, diseased needles, its pathogenicity being assumed as a result of its history in Europe.

### Summary

Three fungi, *Hypoderma lethale*, *Scirrhia acicola*, and *Lophodermium pinastri*, were commonly associated with a needle browning of pines in the southeastern United States in 1949 and 1950. One of these fungi, *L. pinastri*, was investigated in detail at Durham, N. C., in view of its reported pathogenicity to pines in Europe.

Field observations indicate that mature hysterothecia (the ascospore-containing fructifications) of *L. pinastri* may be present at any time of year on dead needles or dead parts of living needles, with the greatest number of them evident, in 1949, during the summer. The greatest number of air-borne ascospores was trapped at this time, also.

Spores germinated in water drops on glass slides over a wide range of temperatures, with the best germination at about 20° - 30° C. At a constant temperature of 22.5° C. ascospore germination was greatest in relative humidities close to 100 percent.

Attempts to infect needles of several southern pine species in a greenhouse, as well as seedlings and saplings out of doors, by applying ascospores of *L. pinastri* to them at several times of the year, were not successful.

On the basis of field observations and pathogenicity tests, it is concluded that *L. pinastri* is probably not pathogenic to pines in the Southeast, but readily invades needles attacked or weakened by other causes.

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## Use of Soils Survey Map

For most counties, maps showing the soils survey are no longer available. Furthermore, the paper of the existing maps is so thin that they are not practical for field use even if they should be available.

Recently, when it seemed desirable to furnish students with individual copies of the county soils map, the need was met by having normal-scale photostat copies made of the original publication. These were glued to a cloth backing and a very serviceable soils map was made.

It was found that a skillful operator can easily translate the colors of the original into distinctive shades of gray and black. The students were of the general opinion that it is just as easy to read the black-and-white if the legend is available for comparison. It is not practical to try to memorize the shades of gray and black, but for the casual user, merely learning the code letters of the legend is sufficient. Some colors which, when adjacent, were difficult to differentiate, actually responded with considerable variance in the gray-black, and were more easily distinguished on the photostat.

Some students preferred the lighter copies, others preferred working with the darker prints. Those which are lighter will take soft black pencil notes very readily, which can be easily erased if the need arises. No particular tone was preferred universally, so irregularities in time of exposure produce variable prints, which will be preferred by some in the group. Sharp focusing is, of course, absolutely essential.

The lettering, which turned out white, shows up very well, and the paper of the photostats has a body which is vastly superior to the original, permitting hard field use.

In addition, the county can be divided into areas or sections and reproduced, enlarged or reduced to fit a tatum or tally board. By folding the original during copying, it is often possible to include the legend on a portion of the copy.

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# Fire, Site, and Longleaf Height Growth

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*Prescribed burning usually stimulates, but sometimes retards, the growth of longleaf pine seedlings. Reaction to fire varies with local differences in soil quality. Careful examination is needed to write a good prescription for burning.*

WHILE THE GENERAL need for prescribed burning of stands of young longleaf pine (*Pinus palustris* Mill.) has been well demonstrated, much remains to be learned about the effects of fire under various specific conditions. This article reports several effects not previously recorded: (1) that summer fires may sometimes be more beneficial than winter burns; (2) that even in areas of a few acres, differences in soil conditions may outrank all other influences on longleaf height growth; and (3) that where soils are poor, the damage even from the lightest fires may outweigh the benefits.

## The Study

The observations reported here are chiefly from a study installed on open cutover longleaf land on the Harrison Experimental Forest, near Saucier, Miss. In October 1935 the grassy rough was burned off to prepare a favorable seedbed. Longleaf seed was sown in December, and in April 1936 the average stand on the study quadrats was 58,000 seedlings per acre.

The study area has 25 square tenth-acre plots laid out in a 5 by 5 Latin square. Each plot includes 9 milacre quadrats arranged in rows and columns 22 feet between centers. There are 15-foot unstocked strips between milacres. The soil is classified as Orangeburg fine sandy loam. There is a 4-percent slope to the east. No grazing took place until 1943, when a little hog damage was noted. Cattle grazed the area heavily in 1946 and 1947.

Five plots were not burned after October 1935. On the other plots four different types of periodic fires—light and severe, summer and winter—were tested, with 5 plots in each treatment. These plots were burned in January and July 1940, in August 1944 and January 1945, and in August 1947 and February 1948 (when the longleaf were 4, 9, and 12 years old). Severe fires were set in the early afternoon and the first two series of light fires after 6 p.m.

The light fires were usually backfires. Flankfires were used only when backfires would not burn clean. In July 1940 fuel was so moist when the "severe" headfires were set that a relatively light fire resulted. Severe fires were started by stringing fire around all four sides of the plots. They were usually set when the fuel was drier than at the time of the light fires.

The light fires were intended to be similar to prescribed burns and the severe fires to resemble wildfires, but the plots were so small that the fires were unlike either large-scale prescribed burns or wildfires. Fuels were quite uniform

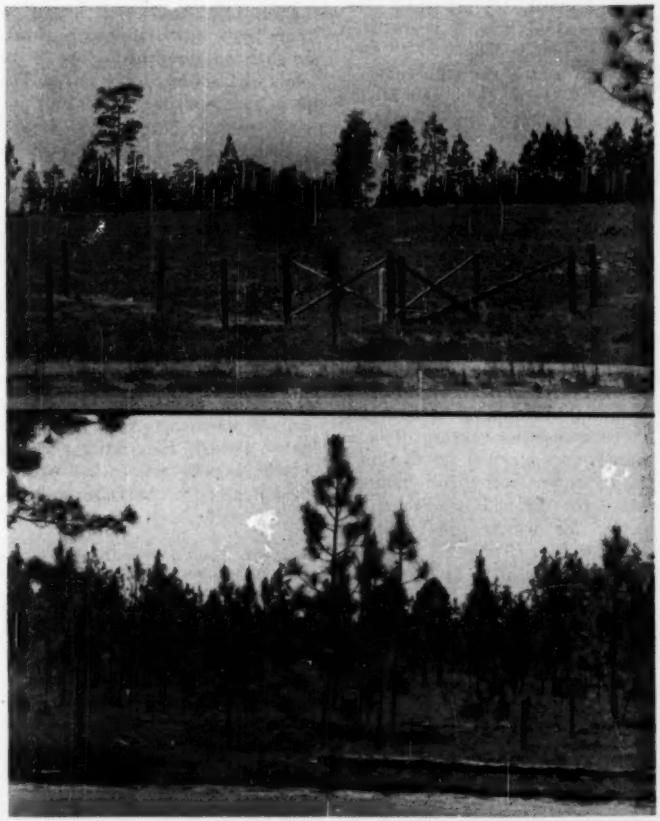

FIG. 1.—*Top*, Northeast corner of study area, March 1936. *Bottom*, Same corner 12 years later. The tallest longleaf on each of the 9 milacre quadrats in the plot in the foreground averaged 12.1 feet in 1947, as against 11.4 feet for all plots. (*U. S. Forest Service photos.*)

[1]The author gratefully acknowledges the work of others on the staff of the Southern Forest Experiment Station who planned and carried out the field work for this study.

for the 1940 fires, but by 1944 there were many pine needles on the quadrats, between which the fuel was grass and other low vegetation. In consequence, the fires flared up as they hit the pine straw and were not typical of fires either in open grassy areas or in dense seedling and sapling stands.

### Survival and Growth

Burning did not benefit survival, but all except the severe winter fires improved height growth.

*Survival.*—At the time of the first fires, 4 years after sowing, survival was 65 percent. At the time of the second fires it averaged 42 percent (24,000 seedlings per acre), with no significant differences between fire treatments or between burned and unburned plots.

The second fires, 9 years after sowing, found about 5,500 seedlings per acre in the vulnerable ½- to 4-foot height class, and all fire treatments caused appreciable mortality (Fig. 2). Summer fires killed more longleaf than winter fires (46 percent of all sizes compared with 26 percent). The seedlings 1 to 2 feet tall suffered greatest losses. Both winter and summer backfires killed more of the smaller trees than did headfires[2]. This second series of fires would have been omitted had welfare of dominant longleaf been the sole criterion of when to burn. It damaged all dominants and gave no compensating benefits; it is the reason that survival for the entire 11 years was better for unburned than for burned seedlings and better for winter fires than for summer fires (Table 1).

*Height growth.*—At the time of the first fires, about 11 percent of all the 4-year-old seedlings were ready to start height growth. Three years later, the tallest seedling on each milacre averaged 2.5 feet in height.

[2] This result may be explained by findings of A. W. Lindenmuth and George M. Byram, who compared backfires and headfires burning under the same conditions of fuel moisture and wind in a rough about one foot deep. They found that within 18 inches of the ground backfires were hotter than headfires. Fire Control Notes 9 (4): 8-9. October, 1948.

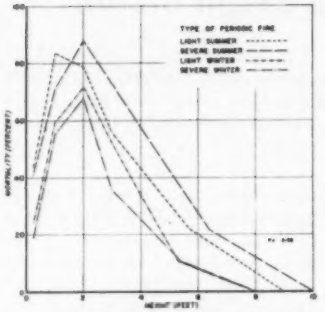


FIG. 2.—Mortality, longleaf pine 9 years old, in plots with 4-year roughs. Harrison Experimental Forest, Mississippi.

In 1947, when the trees were 11 years old, the average height of the dominants was greatest on plots that had two light summer burns (Table 1). The average height on these plots was significantly greater than on unburned plots or on plots with severe winter burns. The plots that had one severe and one light summer fire ranked second in height growth, and those with the light winter fires were third; both of these treatments were significantly better than severe winter fires. The unburned plots ranked fourth and the severe winter plots had the poorest height growth. Apparently damages from the second fires were not great enough to obscure the benefits from the first.

*Brown spot.*—Reduction in the brown spot needle blight (*Scirrhia acicola* (Dearn.) Siggers) probably caused the differences in height growth among the various fire treatments. As Table 1 shows, the average heights of the trees in 1947 were inversely proportional to the amount of brown spot defoliation in 1943. This evidence of brown spot control from 1940 to 1943 is one of the unusual features of the study. Ordinarily, much larger areas than these tenth-acre plots are recommended in burning for brown spot sanitation. There is no clear evidence pointing to any particular reason for the behavior of the disease on these plots.

The fires may have affected longleaf growth for other reasons. Summer burns may have reduced the herbaceous competition more effectively than winter fires. Moreover, by the time the summer-burned plots were fired, the seedlings were six months older, and therefore possibly more fire-resistant, than those on the winter burns.

By January 1947 most longleaf were too tall to be retarded by brown spot, and those less than 3 feet high had only 15 percent of their foliage killed by the disease, even on the unburned plots.

### Soil Fertility

The preceding remarks about the effect of various fire treatments hold true regardless of differences in soil between various parts of the study area. Nevertheless, variations in soil fertility caused differences in height growth twice as great as those between the best and worst fire treatments.

In 1947 the average height of the trees ranged from 6.1 feet on the poorest plots in each treat-

TABLE 1.—BROWN SPOT INFECTION IN MARCH 1943 AND HEIGHT AND STOCKING[1] OF LONGLEAF PINE IN JANUARY 1947. HARRISON EXPERIMENTAL FOREST, MISSISSIPPI

| Treatment | Defoliation by brown spot, 1943 | Average height of tallest longleaf per milacre, 1947 | Longleaf per milacre, 1947 |
|---|---|---|---|
| | *Percent* | *Feet* | *Number* |
| Winter fires: | | | |
| Severe | 30 | 8.6 | 18.4 |
| Light | 20 | 11.8 | 18.2 |
| Summer fires: | | | |
| Severe[2] | 15 | 12.6 | 13.0 |
| Light | 12 | 13.5 | 12.7 |
| Unburned | 25 | 10.5 | 23.6 |

[1] Differences of 2.4 feet between average heights are significant at the 5-percent level of probability. Between average numbers of trees, differences of 7.5 are significant at the 1-percent level, and differences of 5.5 at the 5-percent level.

[2] First fire light, second severe.

ment to 16.1 on the best. Growth was slow on the west side of the study area, near the top of the ridge. It was especially poor in the southwest corner, where sheet erosion had been in progress since the study began, and probably longer.

The beginning of height growth was delayed on the poor sites. Of the 300 seedlings on the poorest plot in the southwest corner, only two were over a foot tall at 11 years. At the same age, the average height of dominants in the row of plots at the top of the ridge was 8.3 feet as compared with 12.2 feet in the other four rows of plots.

Height growth was correlated significantly with the amount of organic matter and the percent of water in the top 6 inches of soil, and with the hardness of the surface soil. By 1947 there was an average increase of 3.9 feet for each increase of 1 percent in organic matter in the top 6 inches of soil (organic content ranged from 1.3 to 5.8 percent). An average increase of 0.9 foot in height growth was associated with increases of 1 percent water by volume and decreases of 1 point in surface hardness (measured on an arbitrary scale of 1 to 10). Since hard surface soil, low moisture content, and low organic content were usually associated closely, it is not possible to say which was primarily responsible for poor height growth.

A field estimate of the depth of organic coloration proved as useful as the time-consuming laboratory analyses of organic content in indicating fertility. An average increase of 2.7 feet in 1947 height was associated with each inch increase in depth of organic coloration (which ranged from 3 to 7 inches deep).

The samples for these analyses were taken in the summer of 1948, after fires in August 1947 and February 1948. To avoid possible soil changes caused by pine litter, which varied in amount depending on tree height, the samples were secured from the middle of the grassy strips between milacres. Although the area was heavily grazed in 1946 and 1947, any large differences in soil characteristics would be due principally to the 1940, 1944-45, and 1947-48 fires. No significant differences were found in the soil on burned and unburned plots (Table 2). If fire were going to change soils in grassy areas to any important degree, these changes should show up in a 13-year contrast of three periodic fires against fire exclusion.

TABLE 2.—SOIL CHARACTERISTICS OF BURNED AND UNBURNED PLOTS IN 1948. HARRISON EXPERIMENTAL FOREST, MISSISSIPPI

| Item | Light summer fires | Light and severe summer fires | Light winter fires | Severe winter fires | No fires | | |
|---|---|---|---|---|---|---|---|
| | | | | | Average | Eroding plot | Other plots |
| Apparent specific gravity | 1.43 | 1.41 | 1.42 | 1.40 | 1.43 | 1.52 | 1.40 |
| Depth of organic coloration (inches) | 4.9 | 5.2 | 5.1 | 5.7 | 5.6 | 3.0 | 6.2 |
| Surface harness[1] | 5.2 | 4.0 | 5.8 | 6.0 | 4.4 | 8.0 | 3.5 |
| Replaceable calcium[2] (milli-equivalent) | .7 | — | — | — | .6 | .4 | .7 |
| | | | | *Percent* | | | |
| Water by volume | 23.8 | 25.0 | 24.2 | 25.3 | 26.4 | 21.7 | 27.5 |
| Organic matter[2] | 2.5 | 2.6 | 2.9 | 2.9 | 2.7 | 1.3 | 3.1 |
| Total nitrogen[2, 3] | .07 | — | — | — | .07 | .05 | .08 |
| Clay[2] | 10.5 | 9.9 | 10.7 | 10.0 | 9.7 | 10.1 | 9.6 |
| Clay and silt[2] | 33.6 | 34.1 | 33.8 | 34.2 | 33.7 | 32.9 | 33.9 |

[1] On arbitrary scale of 1 = very soft to 10 = very hard.
[2] Determined by Department of Soils, Mississippi State College.
[3] Kjeldahl method.

A comparison of the unburned plot in the eroding southwest corner with the other unburned plots shows that it was poorer in many characteristics that usually promote good plant growth. The average dominant longleaf height of 0.8 foot on this plot against 12.9 feet on the other unburned plots is a striking demonstration that longleaf will not grow well on such poor soil.

## Discussion

Despite their limitations, these "test-tube" fires point up certain observations on the relation of fire, soil, and longleaf seedlings.

First, the benefits from burning, such as reduction of brown spot or herbaceous competition, do not always outweight damage from defoliation which sets back seedling development. This study demonstrates net benefits from light fires. In a companion study on poorer soil in the north Florida flatwoods, however, the best growth was on unburned plots. The more frequent and more severe the defoliation from burning, the greater the longleaf seedling mortality and the poorer the growth of the survivors[3,4]. Here also soil differences influenced height growth; longleaf on Leon fine sand made little height growth in 13 years, while that on Plummer fine sand grew about as well as in the Mississippi study.

Second, fires set at arbitrary intervals are not good forestry. The excessive mortality among ½- to 4-foot longleaf seedlings is an important consideration in any planned use of fire.

Third, local variations in soil fertility may cause great differences in height growth which will perplex and exasperate a forester planning his second or third silvicultural burn in young longleaf stands. If there are enough (250 to 500 per acre) well distributed dominant seedlings just out of the grass to make an adequate stand, it usually is good silviculture to ignore severely

[3] McCulley, R. D. Effect of uncontrolled fires on longleaf pine seedlings. Southeastern Forest Experiment Station, Research: 3. Nov. 1948.

[4] Bruce, David. A study of fire and longleaf pine seedlings. 1948. Unpublished report, Southern Forest Experiment Station.

brown-spotted subordinate seedlings.

### Summary

In a test started in south Mississippi in 1935, light and severe fires when longleaf seedlings were 4 years old caused no more mortality in the next 4 years than occurred on unburned plots. Summer and winter fires set when the 9-year-old longleaf had started height growth, however, killed 46 percent and 26 percent, respectively, of the seedlings on the burned plots.

Light fire when the seedlings were 4 years old stimulated height growth. The fires at 9 years killed some of the dominants and retarded growth on the survivors, but this damage was not great enough to hide the benefits from the first fires. Summer fires were more beneficial than winter fires. Control of brown spot by fire is the most likely reason that burning stimulated height growth.

In a companion study on poorer soils in north Florida, it was found that the more frequent and more severe the fires, the lower the survival and the poorer the height growth. The best growth there was on unburned plots.

Local differences in soil conditions had more influence on height growth than did the fire treatments. No evidence was found that fire in open grassy areas altered the soil in any way.

## The Microscopy of Plate-Cut Railroad Cross-Ties

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THE TIMBER ENGINEERING COMPANY is engaged in research on the causes of railroad tie deterioration and the design and fabrication of improved-type ties. This program is carried out in joint cooperation with the Association of American Railroads and the National Lumber Manufacturers Association. This paper is the result of an investigation on one phase of this extensive research program.

The railroad tie industry is one of the largest consumers of wood in this country; approximately 50 million ties were replaced or added to the great network of railroads from coast to coast in the past year. In order to understand more thoroughly the prerequisite for new types and designs of improved ties, it was first necessary to evaluate the structural deformation and magnitude of failure occurring in plate-cut railroad ties.

A total of 38 ties, representing eight different species, were analyzed immediately upon receipt from tie removal operations of various railroads throughout the United States. The ties were numbered and small blocks were cut for processing and subsequent microscopic examination. The blocks measured ⅜ by ⅜ by 1 inch, the long axis of the block running parallel to the long axis of the tie and, except in a few samples used as controls, were cut from the area immediately under the tie plate. Control blocks were cut from a portion of the tie furthest removed from the tie plate areas. The blocks of necessity, had to be intact and not splintered or frayed to permit processing into very thin sections suitable for microscopic study. In order to determine accurately the depth of structural failure in ties, blocks were cut one beneath the other and consecutively numbered according to the depth below the surface of the tie-plate area.

### Processing of Material for Sectioning

Wood taken from ties removed from tracks is not only hard in many cases, but contains sand, grit, dirt, and other imbedded materials, all of which are generally of a siliceous nature. Acid treatment was required to dissolve these substances, but prior to the acid, a boiling period in water was necessary to dispel the air in the blocks.

Hydrofluoric acid has been used universally for removing siliceous material from wood. In this investigation, the reasons for its use were twofold. The acid dissolved the sand, grit, and dirt, and at the same time softened the wood itself. Experiments were conducted to determine an optimum acid exposure period for each species of blocks. The original hardness of the blocks varied with each species, i.e., oak blocks required longer softening periods than western pine, larch, or Douglas-fir. Southern yellow pine, on the other hand, contained so much resin and other hard materials that it required a slightly longer time in hydrofluoric acid than most other softwoods. In general, the time scheduled developed for acid treatment was as follows:

| | |
|---|---|
| Oak—3 to 5 days | Western pine—1 to 2 days |
| Beech—2 to 3 days | Larch—1 to 2 days |
| Gum—2 to 3 days | Douglas-fir—1 to 2 days |
| Southern yellow pine—2 to 3 days | |

In all cases, these periods were sufficient to dissolve most of the extraneous materials present in the blocks, but rendered some of the blocks slightly too soft for microtome sectioning. This softness was overcome by a special embedding process following a water wash and a standard dehydration cycle for the purpose of withdrawing water from the blocks.

### Embedding

A modification of a process developed by S. B. Newman, E. Borysko, and M. Swerdlow of the

TABLE 1.—RESULTS OF MICROSCOPIC EXAMINATION OF THE TYPE AND MAGNITUDE OF FAILURE IN TIES REMOVED FROM TANGENT TRACK

| Tie No. | Area | Species | Appearance under microscope |
|---|---|---|---|
| 1 | Tie plate | Oak | Severe lateral shifting extending throughout eight springwood rings below the tie surface. (Failure 1 1/16-inch in depth). The ninth annual ring exhibited no failure of any kind while the tenth ring evidenced slight lateral shifting. Lower rings of normal structure. |
| 3 | Center of tie between tie-plate areas | Oak | Wood normal. This block used as control. |
| 3 | Tie plate | Oak | Five rings showing severe lateral shifting failures. |
| 4 | Tie plate | Red gum | Failure confined to the top millimeter of the tie; exhibiting very slight buckling or distortion of the wood rays. |
| 5 | Tie plate | Beech | Buckled rays common in top two millimeters of the tie. |
| 11 | Tie plate | Oak | Nine rings show evidence of some degree of lateral shifting in the springwood cells. |
| 12 | Tie plate | Ponderosa pine | Springwood areas of six rings severely crushed. Summerwood areas intact and unaffected. Crushed cells displaced at an angle of 45° to the vertically aligned summerwood cells. |
| 18 | Tie plate | Western larch | Buckled rays; distorted, wavy summerwood cells and crushed springwood cells present in top four millimeters of tie. |
| 21 | Tie plate | Ponderosa pine | Springwood areas of four rings slightly crushed and displaced approximately 40° with relation to the summerwood. |
| 23 | Tie plate | Douglas-fir | Very slight buckling of rays at the extreme top surface of the tie. |

National Bureau of Standards was used for embedding the processed blocks. This process employs monomeric n-butyl methacrylate catalyzed with 2 percent dichlorobenzoyl peroxide. Prior to the preparation of the catalyzed monomer, it was first necessary to destabilize the liquid plastic by separation in a 3 percent solution of sodium carbonate, which removes the polymerization inhibitor. The blocks to be imbedded were then placed in individual No. 11 large gelatin capsules and the liquid plastic poured over the sample, filling the capsule. Upon replacing the caps the capsules were then suspended from rods by means of scotch tape and the rods placed in a 120° F. oven until the resin hardened. The method insured a homogeneous matrix of wood in plastic which was easily cut in a microtome and which firmly held together any fissures or cracks in the sectioning blocks.

Following polymerization the blocks were trimmed and squared in preparation for microtome sectioning. Since any type of lubrication during sectioning would tend to swell the wood structure, the blocks were cut in the dry condition. It was found that n-butyl methacrylate in combination with various concentrations of methyl methacrylate produced an embedding media slightly hard for cutting on a microtome, while the butyl monomer alone produced excellent sectioning properties. The cut sections, approximately 10 to 12 microns thick, were transferred to pure xylene prior to mounting in Canada balsam on permanent glass slides. Sections were unstained since normal staining procedures require the use of various concentrations of alcohol, all of which would cause swelling of the sections or solubilization of the methacrylate embedding media. The embedded blocks were stored in glass bottles in temperatures not exceeding 80° F.

## Types of Failure Observed in Ties Removed from Track

The types of distortion or failure encountered in the microscopic analyses of deteriorated railroad ties may be classified in three categories.

1. *Crushing.*—Evidences of this type of failure were generally found in plate-worn softwood ties and was readily distinguished by the appearance of crushed or completely flattened cells in which the lumen or cavity of the cell had been greatly reduced in size or had disappeared completely. Direct compression can cause this type of cell destruction. Most crushing found in softwoods was accompanied by a diagonal shifting of the springwood cells; this angular displacement varied in range from 20° to 45° from vertically aligned unchanged summerwood cells. The stronger, thick-walled summerwood areas remained unaffected by compressive forces.

The diagonal displacement and crushing exhibited by many ties could possibly be explained as the result of the action of a loose tie plate on the surface of the tie, i.e., loads may not be applied to the plate seat as an exact vertical force, but possibly as a component diagonal force as a result of a tie plate shifting position under load.

2. *Lateral shifting.*—Oak was the only hardwood studied in which this type of failure occurred. The term describes the type of displacement which occurred exclusively in springwood cells. Most recognizable were the bent, or completely sheared rays which were accompanied by a line of severance through the springwood of a growth ring and a lateral or sidewise shifting of one portion of the severed ring. A slight compression of the springwood area also took place. If the rays and rings were realigned to their original position and the wood relaxed to allow for the slight compression which had taken place, the wood would appear to have normal structure.

This lateral shifting action may be partly explained by the movement of the tie plate under load.

3. *Buckling.*—Buckling failure has occurred in softwoods and diffuse porous woods studied, and was sometimes found in conjunction with the crushing of individual vessels or fibers. Most examples of buckling occurred in wood rays, but buckling was also found in annual growth rings of western larch ties in which the summerwood was oriented nearly perpendicular to the tie plate seat.

Table 1 summarizes the results of microscopic examinations of a few of the ties exhibiting the more important structural failures in ties removed from tangent track.

Microscopic examination revealed that major failures, such as complete breakdown of a portion of an annual ring or failures at a depth greater than ¼-inch from the surface, occur only in those woods having concentrations of thin-walled cells. Maximum depth of failure was found in an oak tie which exhibited lateral shifting to a depth of $1\frac{1}{16}$ inches. Microscopic failures, in general, were largely confined to the first half inch below the tie plate. Only in unusual cases will a failure be found at a greater depth.

In order to complete the study of deteriorated railroad ties it was necessary to analyze ties removed from curved track. It must be remembered that curved track is generally banked to reduce the effects of centrifugal force. Thus a tie supporting curved track would have a high end and a low end and corresponding tie plate areas. These are referred to in Table 2.

It was reasonable to assume that the type of train, as well as its speed and direction would influence the magnitude of failure occurring in either end of the tie. For example, high speed trains concentrate more weight on the outer or high end of a tie than the low end and conversely, slow trains tend to produce greater damage to the low end of the tie. A series of red oak ties from both high- and low-speed curves were examined to determine the plate cutting action in these two areas. In Table 2 are summarized the microscopic appearance of representative ties removed from curved track.

The physical appearance of ties removed from slow speed curves (6 degrees radius of curvature) indicated a greater degree of damage on the low end. The microscopic analysis substantiated this observation in the ties from which sections were cut from both the high and low end.

In ties from high speed curves, however, there was no definite evidence to indicate that either end was more severely damaged than the other. The physical and microscopic appearance of both ends of the ties were similar in type and magnitude of failure exhibited.

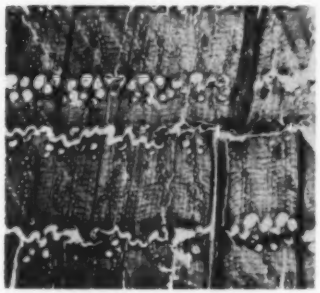

FIG. 1.—Red Oak Tie No. 2. Severe lateral shifting or ring shear is pictured in part of the first and in all of the second and third springwood areas. Note the complete severance of the rays and the intact appearance of each split vessel.

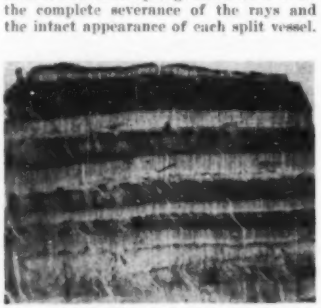

FIG. 2.—Ponderosa Pine Tie No. 12. The lighter vertically aligned cells are thick-walled summerwood, while the severely crushed darker areas are springwood. Note that the springwood cells are shifted to an angle of 40° and that the cell lumens in most cases have completely disappeared, especially in the springwood area of the top ring.

FIG. 3.—Beech Tie No. 5. Note buckled rays and evidence of crushed or distorted springwood cells near the top of the section. Wood structure throughout the remainder of the section is normal. This type of ray failure is typical of beech and gum ties analyzed.

It would appear that shear failures lateral shifting, and crushing are confined to those portions of wood having concentrations of large, thin-walled cells and that denser areas of wood are strong enough to withstand the loads which cause failures in oak springwood and the springwood areas of softwoods. Diffuse porous woods, however, seem to contain such an advantageous distribution of thick and thin-walled cells that an overall resistance to concentrated and component loads is maintained and failure of any type is reduced to a minimum and limited to the extreme top surface.

An attempt to correlate ring width with the amount of lateral shifting in plate cut oak ties could not be accomplished in this investigation. However, observations of sections cut would seem to indicate

TABLE 2.—RESULT OF MICROSCOPIC ANALYSES OF TIE REMOVED FROM CURVED TRACK

| Tie No. | Type of curve speed | End observed | Appearance under microscope |
|---|---|---|---|
| 30 | slow | low | Springwood area of one ring exhibited severe lateral shifting to a depth of 1/4-inch. |
| 30 | slow | high | Evidence of failure in less than first millimeter below surface. |
| 31 | slow | low | Severe lateral shifting in first two rings below surface. |
| 31 | slow | high | Slight lateral shifting in the top 1/16-inch of the tie. |
| 35 | high | low | Very severe lateral shifting in springwood portion of first ring followed by severe lateral shifting in second and third rings. |
| 35 | high | high | Severe lateral shifting and compression of five springwood rings. |
| 36 | high | low | Severe lateral shifting in first four rings. Moderate amounts of shifting failures in following three rings. |
| 36 | high | high | Severe shear failure in first ring and partial failure in lower two rings. |

less evidence of shifting in ties having a slower growth rate, i.e., more rings per inch, than in sections exhibiting fewer rings.

The angle of medullary rays in relation to the plate-bearing area could not be correlated with the type and amount of failure. Observations have indicated that identical failures occur in ties having rays in positions perpendicular to the tie plate as well as at a 45° angle to the tie plate.

Microscopic examinations show that there is a permanent deformation of the wood in cross-ties, caused by the loads imposed upon the wood by passing trains. Plate-cutting of ties is a gradual process and it appears that cell failure under the tie plate occurs in stratified layers; each new layer forming as the preceding strata is abraded.

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# The Cooperative Forest Management Program in New Jersey

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*New Jersey's 12-year experience in cooperative management of small woodlands is notable, not only from the standpoint of introducing better forest practices on private land but also as an example of cooperation among four public agencies and private timber agents. Woodland owners deal with just one agency, the state forester's office, and more effective ground is covered by inter-agency cooperation than would otherwise be possible.*

BY SOME PEOPLE, — foresters as well as laymen—New Jersey is considered a state which has become so industrialized that the possibilities for the practice of forestry are largely limited to providing recreational facilities for the public on the state forests and parks. Actually the situation is quite otherwise. The very fact that the state is located within the most densely populated sections of the country offers unique opportunities for the intensive practice of forestry.

Approximately 46 percent of the state is forested. The northern and western portions are within the oak-yellow poplar type, the southeastern in the oak-hard pine. The former produces some excellent stands that yield up to 18,000 board feet (Doyle) per acre. The oak-hard pine type in the southeastern half of the state has suffered severely from overcutting and wild fire in the past. It presents a totally different problem of forest management.

The markets for New Jersey—grown forest products are excellent. The shipyards and wharves of the metropolitan districts of New York and Philadelphia provide a steady outlet for long oak timbers and piling, the commercial fisheries for pound and shad poles, the basket mills for yellow poplar and gum, the copper refineries for furnace poles and brands, the feltwood mills for oak and pine pulpwood, and the residential areas for fireplace wood.

### Forest Policy

In 1938 the state forester's office started a program of intensive forestry assistance to woodland owners. The program was based upon the premise that the public interest was involved because the commercial methods currently used in harvesting timber from privately owned lands were destructive. These methods consisted in repeatedly "high-grading" for the best stems and species, a practice which was resulting in the replacement of yellow poplar by red maple, of the better oaks by red maple and black birch, and in southern New Jersey of hard pine by low grade hardwoods. In many instances logging methods were damaging soil structure and accelerating erosion. The state's program was intended to promote better marketing methods, protect the soil, conserve at least part of the remaining sawtimber stand and encourage the natural regeneration of desirable species. Over the past 12 years this program has expanded and developed into a cooperative undertaking in which four public agencies and representatives of private enterprise work closely together.

### The Public Agencies

The state forester's office as initiator of the program is nominally in charge of the work. It acts as a central clearing house and keeps records of all operations. It provides two foresters and secretarial services, participates in the field work and in investigation-

al projects applicable to the program.

The regional office of the U. S. Forest Service cooperates by providing funds under the Norris-Doxey Act for the employment of a farm forester. The regional forester also assists by annual inspection and advice. The Northeastern Forest Experiment Station assists by conducting studies of silvicultural and management problems in the oak-hard pine type. One forester and an assistant are engaged in this work.

The U. S. Soil Conservation Service furnishes two forest technicians and one aide. These men are provided at the specific request of the supervisors of the soil conservation districts.

The Extension Service is closely integrated with the program through the extension forester and the county agricultural agents. Their efforts are particularly directed toward the educational phases of the work. Requests for assistance reaching the county agents are routed to the state forester by the Extension Service.

Decisions on all matters of forest management, silviculture, or marketing are made after discussion and agreement between all agencies. Through the resulting coordination of effort, a much wider coverage of forest owners is reached than would be possible by the agencies working independently and a unified public relations program is maintained. This has resulted in much favorable comment among farmers who apparently feel that public agencies should work with and not against each other. It has also eliminated a potential source of conflicting recommendations and interdepartmental friction.

### Timber Agents

The timber agent representing private enterprise is the key to the entire program. He handles the marketing and maintains supervision over the logging operations on all tracts marked for cutting, whether belonging to a resident farmer or absentee landowner. Without his services the owners would have to sell marked timber on the basis of the tree scale, valuation appraisal, and sample contract furnished by the foresters. Experience has shown that in spite of this information the average owner is still unable to handle this transaction adequately. The timber agent materially increases the bargaining power of the owner and invariably obtains a better return. He also enforces compliance with the cutting provisions in the contract and sees that all marked trees are cut and that only marked trees are cut. He solicits bids from lumber operators, draws up the sale contract, obtains a performance bond, scales all logs (Fig. 1), collects monies and supervises the cutting operations. He charges the owner a commission of 10 percent of the gross sales realization for his services.

FIG. 1.—Timber agent scaling logs in New Jersey. The Doyle log rule is applied at the middle diameter inside bark.

The peculiar value of the timber agent is well illustrated by the case of two farmers whose trees were marked for cutting in 1943. The woodlots were 5 miles apart, and approximately the same volume and quality of timber was involved. The first owner sold the timber himself. He received $2,800. The second farmer utilized the services of the timber agent and obtained $6,200. The same logger bought both tracts.

There are two significant points in the use of timber agents. First, every logger who has ever operated under the system is still buying stumpage under the program. Second, the timber agents' log scale overruns the foresters' tree scale by about 10 percent.

Timber agents are selected by the foresters of the public agencies on the basis of integrity, experience, and business ability. This coordination of private effort with public service has provided a helpful solution to many of the problems of the woodland owner.

### The Program in the Oak-Yellow Poplar Type

Under the economic conditions prevailing in New Jersey, forest management policy has necessarily been oriented toward stumpage sales. The shipyards, which represent the major market for forest products, demand heavy timber. Oak logs that produce 5 by 8's and 10 by 12's in lengths up to 50 feet cannot be handled by the type of equipment available on most farms. Also, since the timbers must be delivered green, the lumber operators "store" the trees on the stump and cut to specification as orders are received. While these conditions offer little opportunity for the "integrated" type of farm forestry recommended by some foresters (5) they do open the way for the application of a considerable amount of silvicultural practice. At the same time they return stumpage prices of $25 to $42 per thousand board feet to the owners. There are occasional farmers who utilize their own timber for domestic purposes. These are given guidance and are encouraged to carry out the type of plan that will best serve their needs.

Requests for forestry assistance are received by all cooperating agencies and help is available to all owners who sign an agreement to follow the recommended management practices. This agreement

provides that all trees to be cut will be marked by foresters without charge. If, however, the owner sells or permits unmarked trees to be cut within a 5-year period he pays a penalty of $2 per thousand board feet to the state forester's office for all the trees that were marked.

While the marking is always adapted to the conditions on the ground, the practice in general is oriented toward evenaged management by use of either the group selection or the two-cut shelterwood system. Usually 30 to 50 percent of the volume over 12 inches d.b.h. is removed in the first cut. Since the average woodlot contains about 25 acres it is economically impractical to attempt sustained yield on each ownership. Most plans call for removal of the residual stand after 15 to 20 years, provided adequate regeneration has become established (Fig. 2).

FIG. 2.—On some New Jersey woodlots excellent regeneration of oak and yellow poplar has followed cutting.

After a woodlot has been marked, a report is submitted to the owner showing the number and species of trees and an estimate of the volume involved (*3, 4*). This report is also sent to all interested loggers in the state. The sale is turned over to the timber agent, with whom the owner signs a separate agreement. Payment for timber is always made before its removal from the premises and an itemized report is submitted by the timber agent to the owner and to the state forester on completion of each job. This report gives the dimensions and volume of each log cut and accounts for every marked tree. Copies of the timber agent's reports and information on the financial returns from each job are sent by the state forester to the other agencies. The county agricultural agents are thus kept abreast of all operations occurring within their respective counties and being well informed they make a special effort to promote the forestry program. Any of the managed woodlots are available for demonstrational use and meetings are frequently held there by the extension forester. As a result of this educational work a substantial list of applications for forestry assistance is constantly on file. It is estimated that in 1949 approximately one-half the sawtimber stumpage cut in New Jersey was handled under the program.

### The Program in the Pine Region

The oak-hard pine type occupies about 1,300,000 acres of the Coastal Plain in southeastern New Jersey. Pitch pine is the predominant species on the upland and is associated with shortleaf and scrub pine and a mixture of oaks. The hardwoods on the acid sandy soils of this section are of low quality and rarely suited for anything better than pulpwood or fuel. Pine, on the other hand, produces not only pulpwood but piling and sawtimber, and its growth rate is very much better.

Forest management in the oak-hard pine type is based on the experience and studies carried out cooperatively over the years by the Northeastern Forest Experiment Station and the state forester's office. These studies have shown that prescribed winter burning at 4- to 5-year intervals is the cheapest and most practical method for favoring pine over hardwoods, and at the same time reduces the high fuel hazard that prevails throughout the region (*1, 2*). Management is also directed toward the development of even-aged stands by use of either the two-cut shelterwood or clearcutting with seed trees (*1, 2*).

The first applications of these studies in New Jersey were made on the state forests, and the favorable results obtained there led to the extension of the practice to private lands in 1947. Under this program, prescribed burning plans are drawn up by the foresters of the cooperating agencies. These plans designate the blocks to be burned, the fire lines to be prepared, the character of the ground over, and other pertinent information. Arrangements are made to have the burning carried out by forest fire personnel at the expense of the owner (*2*). In 1948-49, 3,500 acres of private land were treated under these plans.

Southern white cedar occurs in swamps throughout the Coastal Plain of southern New Jersey. The forest management program has been extended to this type on a limited scale. Harvest cuttings are made by clearcutting consecutive strips. The strips, 100 feet wide, are laid out at right angles to the prevailing winds, and their borders

marked with paint. Since most of the trees are less than 12 inches d.b.h., the logs are not scaled, but the tracts are sold by the timber agents for a lump sum on the basis of the number of trees shown in the stand tables.

### What the Program Needs

Because the application of conscious management practice is of comparatively recent development in the United States, little information is available as to whether the cuttings being made—particularly those in the hardwood types on farm woodlots—are silviculturally sound. This condition is true not only of New Jersey but throughout the East wherever the farm forestry program is under way. If better stumpage prices are being obtained for the farmers, and final liquidation of the sawtimber stand postponed, this is well, but if the forests are to be conserved, adequate reproduction of desirable species must be obtained. This is being achieved in some cases but not everywhere. The reasons for the failures should be known so that steps may be taken to correct them.

In New Jersey an attempt is being made to learn something about this by means of periodic inspections and reports of what is happening on the cut-over areas. A few permanent sample plots and milacre transects have also been established. What is needed however, is an adequate study of farm woodlot management practice throughout the Northeast. This study should include regeneration, growth, and mortality, correlated with soil capability. This is a field in which practice is ahead of research and there is danger of making costly mistakes unless sound, practical answers can be obtained to some of these problems.

### Summary

The extension of forest management assistance to woodlot owners in New Jersey has been in effect for the last 12 years. This program is built upon close cooperation between four public agencies and private timber agents. It operates in three main forest types and includes partial cutting, clearcutting, and the use of prescribed burning. It provides the complete handling and supervision of timber sales including log scaling. The marking of timber for cutting is done by the public agencies without charge, as contributing to the public interest. Log scaling, timber sales, and the application of prescribed burning are handled by private individuals and paid for by woodlot owners. Over the 12-year period some 21,000 acres in 620 different ownerships have been handled under the program.

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# Forestry in Old-Growth in the Douglas-Fir Region

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THE CONSIDERATION of forestry and forest practices in Pacific Northwest forests will generally call to mind the great acreage of second-growth timberlands which respond so readily to planned management. However, certain practices dictated largely by the engineering and economic requirements of harvesting the old-growth timber have a far reaching effect on the timber future of the Douglas-fir region. A substantial proportion of the land still carries a stand of virgin timber. Much of this land is capable of growing, when properly managed, five hundred board feet or more per acre per year.

The old-growth forests in the Douglas-fir region consist of Douglas-fir, western hemlock, true firs, and cedars in varying proportion, each with a different degree of tolerance that has its effect on forest practices.

Large areas of Douglas-fir timber are decadent and are suffering heavy losses from decay and mortality. Much of this land, capable of a high rate of growth, carries a virgin stand in which the healthy growing trees are overbalanced by the declining elements with resultant zero or negative increment. It is important to the timber economy that this land be restored to a condition of net growth reflective of the quality of the land. It is the job of the industrial forester to integrate the technical aspects of silviculture, protection, and utilization with the practical economic requirements of logging to accomplish this end result.

Each of these phases of forest management is a separate field with many specialized problems and aspects. However, they are so closely integrated and influence each other so much that it is difficult to discuss any one of them without considering fully the various ramifications of the others.

To discuss the important aspects of protection, silviculture, and utilization that arise in the management and harvest of old-growth timberlands is the intent here.

A description of the Douglas-fir region deals with conditions and terminology that are local and which vary somewhat from those used in other localities. The following terms will appear in this paper:

*Setting*– a tract of timber logged to one landing.

*Landing*—Point at which logs are assembled for loading.

*Cold-decking*—Practice of yarding logs to a point of concentration for later removal to a landing.

*Swinging*—Process of moving logs from a cold-deck to a landing.

*Pre-logging*—Logging the understory timber out of an old-growth stand. This is a generally composed of tolerant pulp species and cedar.

*Salvage show*—A logging show consisting of dead, insect or fire-killed, windthrown, or residual timber left after original logging as unmerchantable. The product recovery will vary from high-grade old-growth fir peelers and sawlogs to pulpwood.

Douglas-fir regenerates and grows best in even-aged stands. The commonly accepted final harvest method for the Douglas-fir type is clearcutting and slash burning. There is a large amount of accumulated debris on the forest floor of old-growth stands. In each standing old-growth tree from 25 to 75 percent is unusable. Consequently, following the harvest there is a heavy accumulation of litter on the ground. This hinders regeneration by preventing the seed cast from reaching a favorable seedbed on the forest floor and constitutes a serious fire hazard to timber, reproduction, equipment, and physical improvements if the slash is not burned.

Along the coastal belt where western hemlock and Sitka spruce are the predominant species, clearcutting is again the accepted method for several reasons. These species also portray better development in even-aged stands. Frequently the size of the timber and topography precludes partial cutting. Much of the timber is decadent and subject to extreme windthrow which indicates clearcutting. The fire hazard does not ordinarily become extreme because of the generally moist climate that favors these species and the practice of leaving slash unburned is becoming prevalent. This is a fairly recent development and has been made possible where it is practiced, only because industry and state protection facilities have developed to the point where the calculated risk is more than justified by the benefits derived.

Hemlock and spruce will regenerate readily under the overstory and on a heavy duff or debris cover. This has been well demonstrated on 2,500 acres of unburned, recently cutover land in Washington. Two thousand acres of this is approximately 80 percent restocked four to eight years after cutting and will soon be fully restocked. The remainder was restocking well. Areas harvested as recently as 1946 are nearly 50 percent restocked. Seed sources ranged up to one-half mile distant.

Forest owners and managers know their timberlands must be maintained in a productive condition as assurance of an adequate supply of raw material for safeguarding investments in conversion plants. The problem revolves about the orderly harvesting of the old-growth stands so that proper protection and treatment will assure the establishment of successive crops. To make complete use of the growth potential of the land requires management which includes silviculture, as well as economics.

Increasing stumpage values have tended to stablize ownership of old-growth timberlands under management which often owns and operates conversion plants. This type of management is aware of the necessity to reinvest a portion of today's profits to provide future timber supplies. This is recognized as sound business practice and as a social and community responsibility.

The first and possibly most important step in the development of stable forest properties was the improvement of fire protection to the point where acceptable standards of fire loss were established. The objective of protecting only the standing timber has been modified with the long-term view of slash disposal and maintenance of equal levels of protection for cutover lands and immature stands. The fact that this problem merited and received attention many years ago is witnessed by our 7½ million acres of older second-growth now in or approaching merchantable size. The man who is investing his time and money in growing new timber crops must be sure that his resources are not going to be lost in a devastating fire.

It is recognized that logging in itself does not harm land nor does properly managed slash burning. It is the reburns that encourage brush cover and degrade sites. Today, approximately three million acres of industrial forest lands are being given fire protection by their owners, in addition and supplemental to that applied by the states, private protection associations, and the federal government. This is business recognition of risks and values which call for protection beyond and above the region-wide level. It is reflected in the efforts made to reduce the fire hazard and risks attendant to the logging operation and to the increasing public use of private lands. This supplemental protection generally is designated to meet the requirements of special conditions of risk and hazard. It varies from a patrolman on an isolated slash area to a completely integrated protection unit of crews, equipment, detection, and communication facilities.

The disposal of slash is a problem complicated by silvicultural, protection, and legal aspects. It is essential that the physical improvements, equipment, standing timber, and immature timberlands be protected by abatement of fire hazard. The slash must be disposed of so the legal responsibility is satisfied and seed sources maintained for natural regeneration.

The trend is away from heavy broadcast burning. Slash is now usually burned under weather conditions that permit the reduction of the hazard but prevent a hard deep burn of the forest floor. This is aided considerably by the more complete utilization which removes a greater volume of the heavy fuels. The states have modified their requirements, and it is frequently possible to establish a level of hazard reduction that will satisfy the legal requirements by such practices as spot burning, fire breaks, or the installation of special protection such as patrols and equipment. There are valid differences of opinion among foresters concerning the necessary degree of slash hazard abatement and methods for accomplishing it. These differences are generally a reflection of varying local conditions. However, most everyone recognizes that, when properly used, fire is a valuable protection and silvicultural tool in the Douglas-fir region.

Many of the silvical facts concerning the Douglas-fir type were determined over a long period of time by the basic research of such men as Munger, Osborne, Isaac, Hanzlik, Jacobson, and others. The industrial forester picked them up translated, applied and integrated them into forms applicable to active logging operations and expanded them into systems of cutting which assured succeeding crops. A variety of methods designed to provide for regeneration and to afford increased fire protection have been tried over the years. These have been modifications or variations of clearcutting.

The seed-tree method is based on the selection of certain windfirm trees of good grown class properly spaced to provide adequate seed. This method is fully successful only in a relatively small area in the Douglas-fir region on gravelly soil types where the species develops deep tap roots and is therefore exceptionally windfirm. On these lands of gentle terrain the isolated trees will withstand windthrow for many years. This is typical of the gravelly and rather low sites where the regeneration occurs readily and very little competing cover comes in when the areas are not reburned.

The practice of leaving seed blocks was the second step, and resulted from the disastrous effects of windthrow to single seed trees under certain conditions. Single seed trees or small groups of trees were not sufficiently windfirm to stand on steeper slopes or soil types other than gravel. When seed blocks are properly located in order to give coverage and withstand exposure and the dominant species in the seed block are best suited for regeneration on a site under consideration, this method is adequate. It is now widely used to comply with the Washington Forest Practices Act and the Oregon Forest Conservation Act both of which require that 5 percent of each cutting area be occupied after slash disposal by seed-bearing timber of commercial species.

Some operators with predetermined rotations are providing seed sources that will secure more rapid regeneration. They are leaving seed blocks that are actually delayed settings and these will be removed after having served their purpose. The experience has been that 20 percent of the stand left in operable size blocks will assure regeneration in a relatively short period and will also provide a supply of timber which justifies later removal.

In the case of one operation which uses seed blocks, the practice has been to develop the main roads up the drainages with spurs coming back on the ridges. All timber that can be reached from either the main roads from below or spurs from above is logged and the timber in the middle of the slopes that normally would be cold-decked and swung is left as seed blocks. This timber is of good quality and being in the middle of the slope is not seriously exposed to windthrow. It can be removed with little or no additional road development after it has served its purpose as a seed source.

While the two methods described above have been successful in assuring a seed supply when judi-

ciously applied, they have not contributed to the solution of the overall problem of utilizing the total growth of our old-growth forests.

A method of operation in old-growth which is receiving increasing support is one which permits salvage of the values now being lost each year and at the same time insures a condition of net growth in the stands reserved for later cutting. This system is predicated on a complete system of roads throughout old-growth forests.

This allows salvage whereby the dead and down timber, defective and dying old-growth, and where possible, the understory timber may be removed. In old-growth stands in which it is possible to salvage the declining elements and still leave a sufficient number of vigorous trees the stand can be placed in an adequate net growing condition.

It is estimated that if this measure could be applied to all old-growth stands now under private management plans or in public ownership it would add three billion feet to the annual allowable cut of the Douglas-fir region. Industry, which has the most to gain, is working on ways and means of recovering all that can be handled practically and economically.

The pre-logging of the understory of old-growth stands can and is providing an additional supply of pulp species and small cedar. This will prevent considerable breakage and loss in both large and small timber. Such a program requires heavy investment in advance road construction and must result in final clearcutting of sufficient volume to justify the road investment.

Out of the recognized need for such a system clearcutting by delayed settings was developed. These settings are clearcut blocks separated by tracts of green timber during the first cutting, and later, by stands of timber interspersed with areas on which the hazard has been abated, or by stands of reproduction.

In developing a logging plan of delayed settings the initial settings are located so that substantial buffer strips of green timber are left between each setting. These serve both as fire breaks and seed sources. Each tract is clearcut, burned, and surrounded by a seed source. It will regenerate readily. When the initial settings have regenerated, half of the residual or delayed settings are cut, leaving fire breaks both of green timber and of land on which the hazard has already been abated. The fire breaks at the time of the third round of cutting will be restocked lands. This is a very satisfactory method for properties large enough to assure an operating period long enough to allow a regeneration period of six to ten years between cuttings.

One large operation in the region is projecting its roads through virgin timber and is removing widely staggered tractor settings of 10 to 25 acres each. Areas surrounding the settings are salvaged for down timber, snags, defective trees, and in certain cases, the understory. The purpose of the small clearcut settings is to provide enough volume to make the operation practical and to justify the road investment that must be carried until the timber is operated on a heavier cutting basis. The results of this have been poor primarily because the scattered settings have been too small. With an increase in volume recovery by increasing the size of the settings, such operations can and will be a desirable practice on both private and public lands. Although this is termed "selective logging," it is actually a salvage operation coupled with uneconomically small clearcut settings.

The practice of pre-logging and salvage logging in reserve stands of old-growth have become too well established in substantial old-growth ownerships to be considered a novelty. As experience demonstrates that this desirable silvicultural practice is not irreconcilable with the economic operation of old-growth timber, then salvage and pre-logging will stretch further our limited old-growth timber supply.

The systems of cutting already discussed have been refined into a method termed area selection. It is a system of delayed settings by which the settings are removed in three or more rounds of cutting. In tracts large enough to be organized immediately on a sustained yield basis, area selection can be established when 60 to 70 percent of the permanent road system is projected in the first round of cutting. In this manner the entire forest is opened up. Timber may be removed from any portion of the property as dictated by a blend of the economic and silvicultural requirements. Thus all cutting will tend to bring the entire forest to a condition of adequate net growth by early removal of the more decadent elements and by salvage and pre-logging. It is the considered opinion of many Douglas-fir foresters that on public lands settings which are smaller than is necessary for satisfactory fire protection and regeneration have been required, thus making delayed settings difficult from the operator's standpoint. A system of delayed settings requires a heavy investment involving three to five miles of road for each section of land, and a continuing maintenance cost. This investment could be reduced by shrinking the number and increasing the size of the settings at least in the first round of cutting where seed sources are reserved on all four sides. The problem of slash hazard abatement does not increase in direct proportion to the increased size of settings. Regeneration will be as certain, and the initial road development cost materially reduced. Experience indicates that settings from 150 to 200 acres are satisfactory both from the standpoint of starting the new forest and abating the slash hazard.

Utilization of the wood on the ground is closely integrated with all phases of timberland management and particularly with slash disposal. Many of the very hard and destructive fires can be traced directly to the large volume of wood left after logging of former years. With the development of

integrated wood processing facilities, utilization has improved substantially. This makes it possible for the small or medium-sized owner to take advantage of an integrated market.

The high stumpage value of individual old-growth trees, which may range up to $400 for a single tree, has resulted in such measures as pulling the tree up hill with lines from a double drum tractor to reduce breakage. This may result in nearly full recovery of a brittle high value peeler tree which might otherwise have been largely lost through normal felling practices.

The attractive log market of the last ten years has made possible intensive salvage programs that have resulted in the recovery of large volumes of formerly inoperable timber. Much of this was left in the highly "selective logging" of the depression years and added materially to the log supply in the war and postwar market.

In many cases salvage logging is carried on in accessible old-growth tracts with the removal of the dead, down, and defective trees. Large volumes of fire-killed timber, previously regarded as a loss, are recovered.

Three of the important aspects of the management of the old-growth Douglas-fir forest have been discussed: The protection of the forest, the application of the silvicultural practices designated to insure successive crops, and the utilization of the old-growth timber.

It appears to the writer that the most significant and important trend in forest management is that the forester is now being placed in position to help make the decisions before the first tree is cut. This is determining the method and manner of harvest of old-growth forests in the Douglas-fir region that are under responsible management. The forester's decisions on maintenance of the forest's productivity and reduction of hazard have become an integral part of the logging plan. It is no longer true that foresters are raising timber and loggers are harvesting it, for they have joined hands in the common purpose of production and harvest of forest crops.

# Tracheid Length Variation in Conifers as Related to Distance from Pith[1]

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*A relationship between tracheid length and distance from pith was found in four coniferous trees. The relationship could be expressed mathematically for each tree without regard to age or level in the trunk, provided that the portion of the bole close to the ground was eliminated. The shortest tracheids were found near the pith; outward from the pith, tracheid length at first increased rapidly, then more slowly and with a tendency to level off.*

*Tracheids near the tree base were shorter than those at higher levels at points equidistant from the pith.*

*Springwood tracheids in white fir were found to be shorter than summerwood tracheids of the same annual ring.*

FIBER LENGTH has long been known to be an important factor in the paper-making qualities of wood of a species. Variations in fiber length throughout a tree are likewise of interest to wood anatomists. Yet progress toward knowledge of fiber length variability and the factors that affect it, has been slow and arduous. Such information, even within a single tree, must be laboriously obtained by analysis of numerous samples from many carefully chosen regions in the tree. There are patterns of variability through the trunk which have ruled out reliance on analysis of a single random sample.

In the present study, attention has been focussed on the relationship between tracheid length variation in coniferous wood and linear distance from the pith throughout the trunk, regardless of the age of the tissue. A pattern of variability was found which could be expressed in mathematical terms. The labor of fiber length studies for a specific kind of wood should be greatly decreased by consideration of this pattern in future work of this kind.

[1] Condensation of a thesis submitted in partial fulfillment of the requirements for the degree of Doctor of Philosophy at the New York State College of Forestry.

## Literature Review

There is general agreement that in coniferous trees the fibers are shortest near the pith. As the number of rings from the pith increases, at any given level along a radius, there is a rapid increase in length to a first peak. Beyond this point the results of different investigators are somewhat at variance. The peak length may be maintained, or there may be a slight further increase, or even a reduction in length (*11, 8, 9, 6, 12, 7, 4*).

There is general agreement that the shorter tracheids are situated at the lower levels of the trunk (*12, 8, 9, 4, 7, 5*). According to some investigators, within a given annual increment, an increase is registered upwards until a maximum is reached, after which the trend is reversed (*11, 12, 9, 4*). Kribs (*8*), on the other hand, found that tracheid length sometimes decreased beyond this maximum; at other times it remained constant or increased slightly.

There is disagreement as to whether tracheid length is correlated with ring width; Shepard and Bailey (*12*) could find no correlation, while Helander (*7*) found the correlation to be negative. MacMillan (*10*) brought out the fact that suppressed trees have a higher percentage of short-length fibers than do free-grown trees. In reaction wood, it has been determined that tracheids of compression wood are shorter than those from wood on the opposite side of the tree at the same height in a growth increment (*12, 9*). The tracheids are shorter near a branch whorl (*2*). Within a growth increment, at a given level in the tree, the summerwood tracheids are generally considered to be longer than the springwood tracheids (*8, 9, 4, 7*); Gerry (*5*), however, found the opposite to be the case.

## Materials and Methods

Four trees, representing two genera, and three species, were sampled to obtain the materials for this study. The trees sampled consisted of one white fir, *Abies concolor* (Gord.) Engelm.; one noble fir, *Abies procera* Rehd.; and two Douglas-firs, *Pseudotsuga taxifolia* (Poir.) Britt. The white fir was 91 feet in height. The noble fir was 200 feet in height, with a diameter of 48 inches at breast height. One Douglas-fir tree (designated Tree One) was 189 feet in height with a breast high diameter of 29 inches; the other Douglas-fir (Tree Two) was 162 feet in height with a breast high diameter of 24 inches.

Discs were cut from the bole of each tree at varying heights above the ground. Radii, along which samples were to be taken, were selected in such a way as to avoid obvious defects such as knots and decay. Points along these radii were marked at definite linear distances from the pith, without regard for ring-count. A section of the annual ring at which each point fell, constituted a specimen for maceration and tracheid length determination. Only the white fir specimens were further subdivided into summerwood and springwood before maceration.

Maceration was with nitric acid and sodium chlorate. Part of the tracheid measurements were made by means of a microscope equipped with an eyepiece micrometer. The rest were made with the aid of a micro-projector.

## White Fir

Discs were taken from the white fir tree at 2, 22, 35, 50, 64, and 78 feet above ground. Three radii were sampled at each height, except at the 2-foot level, where, due to decay, only one radius was available. Summerwood was separated from springwood by dissection of the annual ring before maceration. In all, 15,800 tracheids were measured.

It was found that at 132 of the 158 points sampled, summerwood tracheids were longer than springwood tracheids from the same annual ring. Summerwood tracheids averaged 2.86 millimeters while springwood tracheids averaged 2.68 millimeters in length.

Measurements of springwood and summerwood tracheids at a given point were then combined. Mean length at each point is given in Table 1.

The data were transformed so that equations for straightline regressions of the form $\log \frac{R}{L} = a + b \log R$ could be fitted by the method of least squares (*1, 13*). R is linear distance from pith and L is tracheid length. Such an equation was calculated for the data at each height, and for all heights combined exclusive of the 2-foot height. Table 2 summarizes statistics for the equations.

Plots of estimated tracheid length based on the statistics of Table 2 are shown in Figure 1. Although it would have been desirable to test differences be-

TABLE 1.—MEAN TRACHEID LENGTH, WHITE FIR

| Distance from pith | Height in tree, in feet | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 2 | 22 | 35 | 50 | 64 | 78 | 22 and higher | |
| | | | | | | | Actual | Estimated[1] |
| | *Millimeters* | | | | | | | |
| 5 | 1.29 | 1.47 | 1.56 | 1.58 | 1.79 | 1.58 | 1.61 | 1.65 |
| 10 | 1.51 | 2.03 | 1.90 | 2.16 | 2.21 | 1.64 | 1.99 | 1.97 |
| 15 | 1.41 | 2.24 | 2.27 | 2.54 | 2.32 | 1.99 | 2.27 | 2.19 |
| 20 | 1.76 | 2.51 | 2.43 | 2.75 | 2.45 | 2.20 | 2.47 | 2.36 |
| 25 | —— | 2.73 | 2.54 | —— | —— | —— | 2.64 | 2.51 |
| 30 | 2.09 | 2.76 | 2.82 | 2.96 | 2.58 | 2.77 | 2.78 | 2.63 |
| 40 | 2.51 | 2.95 | 2.98 | 3.13 | 2.81 | 2.92 | 2.96 | 2.83 |
| 60 | 2.67 | 3.16 | 3.12 | 3.35 | 3.16 | 3.12 | 3.19 | 3.15 |
| 80 | 2.51 | 3.45 | 3.27 | 3.71 | 3.40 | —— | 3.46 | 3.39 |
| 100 | 2.72 | 3.45 | 3.62 | 3.69 | 3.60 | —— | 3.59 | 3.60 |
| 150 | 2.88 | 3.86 | 4.00 | 4.18 | —— | —— | 4.01 | 4.00 |
| 200 | 3.04 | 3.97 | 4.18 | —— | —— | —— | 4.08 | 4.31 |
| 290 | 2.64 | —— | —— | —— | —— | —— | —— | —— |

[1] Estimated from regression equation developed for the combined measurements of all heights exclusive of the 2-foot height.

TABLE 2.—STATISTICS FOR REGRESSION OF LOG $\frac{R}{L}$ ON LOG R, WHITE FIR

| Height in tree | Regression constants[1] | | Coefficient[2] of correlation | Standard error of estimate |
|---|---|---|---|---|
| | a | b | | |
| *Feet* | | | | |
| 2 | 0.0389 | 0.7781 | 0.9723 | 0.0973 |
| 22 | −0.0480 | 0.7514 | 0.9659 | 0.0900 |
| 35 | −0.0237 | 0.7366 | 0.9701 | 0.0856 |
| 50 | −0.0599 | 0.7375 | 0.9715 | 0.0803 |
| 64 | −0.0944 | 0.7769 | 0.9679 | 0.0824 |
| 78 | 0.0960 | 0.6610 | 0.9053 | 0.0928 |
| 22+ | −0.0343 | 0.7392 | 0.9657 | 0.0876 |

[1] Regression constants are for the equation, $\log \frac{R}{L} = a + b \log R$.

[2] All the coefficients indicate highly significant correlation.

tween heights by approved statistical methods, the fundamental requirement of random selection of tracheids for measurement was not fulfilled for this tree. This statement requires explanation.

It seems logical to assume that in proceeding from the shorter springwood tracheids to the longer summerwood tracheids within a given annual ring, the increase in length is gradual. The transition zone in white fir is comparatively wide and is gradual, making accurate separation of springwood and summerwood difficult. An error in one direction decreases the apparent average length of both summerwood and springwood; an error in the other direction increases both values. Since each annual ring sample was divided into springwood and summerwood, and therefore subject to this error, selection was not random.

In Figure 1 the isolation of the curve for the 2-foot height is quite apparent. The curves representing the remaining heights fall reasonably near one another and indicate no consistent effect of height. The data of all the heights, with the single exception of the 2-foot level, therefore were combined and used in computing a single equation which represents closely the tracheid length variation from the pith outwards in the entire upper part of the tree. This equation is $L = 1{,}082R^{0.2608}$. It was obtained from the constants given in the last line of Table 2. Tracheid lengths calculated from this equation are given in the last column of Table 1 and are plotted in Figure 2.

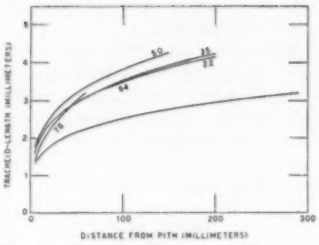


FIG. 1.—Tracheid length estimated from regression equations for each height sampled in the white fir tree. The numbers indicate height above ground, in feet.

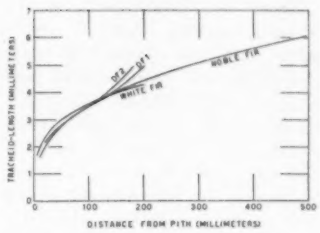


FIG. 2.—Tracheid length estimated from the regression equations developed for each of the four trees included in this study.

TABLE 3.—MEAN TRACHEID LENGTH, NOBLE FIR

| Distance from pith | Height in tree, in feet | | | 38 and higher | |
|---|---|---|---|---|---|
| | 38 | 112 | 153 | Actual | Estimated |
| | *Millimeters* | | | | |
| 10. | 1.69 | 1.50[1] | 1.69 | 1.63 | 1.60 |
| 17.5 | 1.87 | 1.88 | 1.90 | 1.89 | 1.93 |
| 50. | 3.03 | 2.91 | 2.83 | 2.92 | 2.77 |
| 100. | —— | —— | 3.67 | 3.67 | 3.51 |
| 200. | 4.85[2] | 4.41 | 4.59 | 4.62 | 4.45 |
| 260. | —— | —— | 5.54 | 5.54 | 4.87 |
| 350. | 5.12 | 5.45 | —— | 5.28 | 5.39 |
| 500. | 5.41 | —— | —— | 5.41 | 6.10 |

[1] Significantly different (at the 1-percent point) from means at other heights.
[2] Significantly different (at the 5-percent point) from means at other heights.

TABLE 4.—MEAN TRACHEID LENGTH, DOUGLAS-FIR, TREE ONE

| Distance from pith | Height in tree, in feet | | | 60- and 76-foot heights | |
|---|---|---|---|---|---|
| | 2 | 60 | 76 | Actual | Estimated |
| | *Millimeters* | | | | |
| 20 | 2.10 | 2.04 | 2.05 | 2.04 | 2.15 |
| 50 | 2.61 | 3.17[2] | 2.70[2] | 2.94 | 2.80 |
| 150 | 3.00[1] | 4.09 | 4.00 | 4.04 | 4.10 |
| 200 | 2.95[1] | 4.85 | 5.12 | 4.99 | 4.95 |

[1] Significantly different at the one-percent level from means at the other two heights.
[2] Difference between means at the 60- and 76-foot heights is significant at the one-percent level.

## Noble Fir

Discs were taken from the noble fir tree at 38, 112, and 153 feet above ground. One radius at each height was sampled. Summerwood was not separated from springwood. Points equidistant from the pith were selected at the different heights. A total of 850 tracheids, taken from seventeen points, (fifty tracheids at each point) were measured. Mean tracheid lengths for the samples are given in Table 3.

The selection of tracheids for measurement was random and a valid analysis of variance to compare means at points equidistant from the pith but at the different heights was possible. It was determined that the means at only two points were significantly different from the corresponding means at the other heights (Table 3).

Examination of the tree cross-sections from which the two discrepant samples were taken revealed no apparent abnormalities in tissue that might affect tracheid length. In spite of the differences shown by variance analysis, the actual means of the two individual samples vary little from their fellow means at the other two heights. The differences therefore were ignored, the data for the two discrepant samples were included and all heights were combined. The final conclusions are probably not weakened by such small departures.

A regression equation of the form $\log \frac{R}{L} = a + b \log R$ was calculated from the combined data of all heights by the method of least squares. R is linear distance from pith and L is length of tra-

cheid. The correlation coefficient for the variables, $\log \frac{R}{L}$ and Log R, was found to be highly significant. The standard error of estimate for the calculated equation was found to be 0.08105. The equation is:

$$\log \frac{R}{L} = 0.13944 + 0.65736 \log R$$
$$\text{or } L = 0.725R^{0.3426}$$

The curve for tracheid length variation from the pith outwards, as calculated from this equation, is plotted in Figure 2; the estimated values are given in the last column of Table 3.

### Douglas Fir, Tree One

Discs were taken from this Douglas-fir at 2, 36, 60, and 76 feet above ground. One radius at each height was sampled. Points equidistant from the pith were selected at each height; 800 tracheids (fifty from each sample point) were measured. Springwood and summerwood were not separated. Mean tracheid lengths (except for the 36-foot level, which had to be discarded) are presented in Table 4.

An analysis of variance showed that means of samples from the 2-foot height were distinctly less (except close to the pith) than means from higher in the tree but at equal distances from the pith. Means at the 36-foot height (not given in the table) were also low but had to be discarded when it was found that this disc had been taken near a branch whorl. It has been shown that tracheids are shorter near a branch whorl (*2*). There were left for consideration only the samples from the 60-foot and 76-foot heights.

In Table 4, at the 60- and 76-foot heights, only the means at 50 millimeters from the pith differ significantly from each other. The actual difference is small enough so that in view of the similarity of the other points sampled, it was felt that these measurements should not be discarded. No cause for the difference could be traced to presence of compression wood or other wood formations that are known to affect tracheid length. Data for the two heights were then combined.

A regression equation of the form $\frac{R}{L} = a + bR + cR^2$ was fitted to the means of the combined data of the 60- and 76-foot heights. R is linear distance from the pith and L is mean length of tracheids. The index of correlation was found to be high, 0.996, indicating good correlation between the variables $\frac{R}{L}$ and R. The standard error of estimate was 1.04. The equation is:

$$\frac{R}{L} = 2.85 + 0.3376R - 0.00075R^2$$
$$\text{or } L = R(2.85 + 0.3376R - 0.00075R^2)^{-1}$$

Estimated tracheid lengths are given in the last column of Table 4, and are plotted in Figure 2.

### Douglas Fir, Tree Two

Cross-sections were taken from this tree at 36, 76, and 108 feet above ground. The samples were carefully selected to eliminate tissue suspected of abnormality in any way. Unfortunately, the disc from near ground level had to be eliminated because of knots.

Samplings were equidistant from the pith and were confined to one radius at each height. 700 tracheids were measured. Summerwood and springwood were not separated. Mean tracheid lengths at points sampled are presented in Table 5.

An analysis of variance to compare tracheid length at points equidistant from the pith at the different heights showed no significant differences due to height.

A regression equation of the form $\frac{R}{L} = a + bR + cR^2$ was fitted to the means of the combined data from all heights. The index of correlation was found to be high, 0.996, indicating good correlation between the variables $\frac{R}{L}$ and R. The standard error of estimate was 0.88. The equation is:

$$\frac{R}{L} = 3.37 + 0.3351R - 0.00084R^2$$
$$\text{or } L = R(3.37 + 0.3351R - 0.00084R^2)^{-1}$$

The estimated tracheid lengths are given in Table 5, and are plotted in Figure 2.

### Discussion

This study of variation in tracheid length in normal wood in the trunks of four trees shows that there is a direct relationship between length of tracheid and distance from the pith. This relationship is independent of height in the tree, providing the tracheids are located somewhat above ground level. The relationship can be expressed mathematically. At the 2-foot level, the tracheids are definitely shorter than at the higher elevations. This difference between the 2-foot level and the higher levels increases with increased distance from the pith.

The equations for the regression of tracheid length on distance from pith developed for the two true fir trees (*Abies* spp.) are very similar. The same can be said for the equations representing the two Douglas-fir trees.

A plot of tracheid length, as

TABLE 5.—MEAN TRACHEID LENGTH, DOUGLAS-FIR, TREE TWO

| Distance from pith | Height in tree, in feet | | | All heights | |
|---|---|---|---|---|---|
| | 36 | 76 | 108 | Actual | Estimated |
| | *Millimeters* | | | | |
| 20 | 2.07 | 2.02 | 2.06 | 2.05 | 2.06 |
| 50 | 2.74 | 2.90 | 2.75 | 2.80 | 2.77 |
| 100 | 3.40 | 3.48 | 3.70 | 3.53 | 3.51 |
| 130 | 3.95 | 3.98 | 3.87 | 3.93 | 3.97 |
| 180 | 4.81 | 5.12 | —— | 4.97 | 4.94 |

calculated from these regression equations and shown in Figure 2, emphasizes this point. The curves are not identical for the two true firs, nor for the two Douglas-firs. Nevertheless, they are very close to each other and the shapes of the curves in each pair are very similar.

These resemblances lead to the inference that there is a definite relation between tracheid length and distance from pith, independent of height, which may prove to hold for each species, perhaps even for all the species of a genus.

If future investigations bear out these findings, the labor involved in studies of tracheid length variation in the trunks of conifers will be greatly reduced. The sampling need only be such as to provide sufficient data for a curve, making certain that the sampling is from normal wood, well above ground level, and allows for a few points that may deviate from the curve for unexplained reasons. With these precautions, it should be possible to compare different trees as to variation in tracheid length on a tenable basis.

The author wishes to express his appreciation for the advice and assistance of Harry P. Brown, J. Elton Lodewick, Carl Forsaith, and J. C. Sammi. Acknowledgement is due members of the Forest Products Laboratory and the Pacific Northwest Forest Experiment Station for allowing the use of facilities and equipment in carrying out this study.

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# Notes

## Farm Forest Products of Southern Wisconsin

In discussing forest products of southern Wisconsin, it is first necessary to explain the term "southern Wisconsin." A line connecting LaCrosse and Manitowoc was arbitrarily chosen as the approximate northern boundary. This line also nearly divides the pulp-producing from the nonpulp-producing section of the state. This nonpulp-producing area contains 32 counties from the Wisconsin-Illinois line north to and including the following counties: LaCrosse, Monroe, Juneau, Adams, Waushara, Winnebago, Calumet, and Manitowoc. The area contains between 2 and 3 million acres of forest land, supporting at least 30 million cords of wood, including at least 2 billion board feet of sawlog timber. Practically all the forested land is is in farm woodlot ownership. The stands are mainly hardwood, the most important species being red oak, which makes up 68 percent; white oak, 20 percent; black oak; hard and soft maple; white ash and red and white elm. Less important species often found locally in fair concentration include black ash, cottonwood, aspen, white birch, jack pine, black walnut, butternut, cherry, hickory, and hackberry. Stands containing oak in merchantable quantity and quality are fairly well distributed. The southeastern part of the state has most of the red and white elm and white ash while the southwestern part contains most of the basswood and hard and soft maple.

Although most of timber is in farm woodlot ownership, there are some commercial holdings along the Wisconsin River. Timber sold from the woodlot might be classed as (1) standing timber in the form of stumpage and (2) products which wholly or partly are manufactured or processed by the farmer on his own land. There are about 38 stationery or semistationary mills operating full time and probably at least 100 more which operate part time. A mill survey made in the area by the Lake States Forest Experiment Station in 1942 indicated 190 mills of all types, producing that year 51 million board feet. In 1946, 35 million board feet were produced in 15 southwestern Wisconsin counties. In southwestern Wisconsin one of the most important products is railroad ties. About 2 million ties are produced in this state, of which probably half are cut in the southern section. In the Lake States as a whole there is an annual deficit in production as compared to normal replacements of about 1 million ties. Even in this era of mechanization, at least 100,000 hewn ties are produced in the Lake States per year. Most tie mills sort out No. 1 logs to be sold as veneer logs or grade saw them to produce lumber.

In southwestern Wisconsin especially, and also in certain other sections such as the Fond du Lac-Sheboygan area, there are several mills specializing in the grade sawing of hardwoods mainly for the furniture and millwork industries. Their main products are 4/4 to 8/4 lumber, furniture squares, and bowling pin blanks. Other mills produce handle blanks and implement blanks such as tongues, drag bars, stone boats, etc. Almost all mills do some custom sawing of farm logs into farm building lumber. Many of the smaller mills in terms of annual production depend almost entirely upon custom work for their income.

Of the products which are wholly or partially processed by the farmer on his own land, the most important are fuelwood, fence posts, logs, piling, poles, hewn ties, and box bolts. At least 40 percent of all farmers provide some or all of their fuel from the woodlot. Fuel wood ranks highest in both value and quantity of all products cut from farm woodlots. For the period of July 1944 through June 1945 about 540,000 cords were cut in the woodlots of southern Wisconsin.

The second most important product is fence posts. During the period July 1944 through June 1945, 2,710,000 fence posts were produced in this area; which incidentally is enough posts to build about 10,000 miles of fence. Probably next in value of products are sawlogs, produced or sold as such. This does not include logs sold in the form of stumpage. For the July 1944 to June 1945 period, production in this area was about 9 million board feet. The other farm woodlot products—piling, poles, hewn ties, and box bolts—are of lesser importance. S. R. Gevorkiantz and H. F. Scholtz have shown that the average price paid farmers for stumpage is about 21 percent of the price received by the mill for No. 2 Common lumber. However, if the farmer cuts and skids the logs to a landing where they can be loaded on trucks he can earn an additional 19 percent of the price. Translated into hard cash terms assuming a $65 price for No. 2 lumber, stumpage alone is worth $13.65 while the same logs in a deck in the woods would bring $26 per thousand.

My personal experience in southwestern Wisconsin indicates that sale of hardwood lumber, especially in the lower grades, has definitely slowed down. This in turn reduces stumpage payments to the farmers. However disposal of rough lumber in the southwestern part of the state has never been the problem that it is in the southcentral and southeastern part, mainly because there are several commission agents operating in the southwest where production is heavier. These agents are familiar with all the hardwood markets and buyers are able to furnish what the ultimate buyer wants from one or more of their mill contacts. In the rest of the southern section the disposal of logs or lumber is another matter. Direct sale to wood-using

industries is difficult because amounts involved are usually small and all grades and several species are usually involved in each lot of lumber offered for sale. Often the lumber has not been as accurately manufactured as that produced in more heavily timbered sections of the state where equipment is in better condition.

This very discouraging picture to the timber owner has been partially solved by a development begun about 1940 around Eau Claire, Wis., namely the "Mobile Mill." Mr. C. D. Jackson built one of the first successful mobile mills capable of producing accurate building lumber for farm use. This type of mill has the advantage of being able to move quickly and for a very small cost, thus allowing the farmer to use his own lumber instead of selling his logs and buying at retail prices. Several other mills capable of doing the same job with equal accuracy and speed have been developed and the operation of at least four of this type mill in south and southeastern Wisconsin has given the farm woodlot owners an opportunity to realize a very substantial return from their timber. Another factor which has helped in the increase in consumption of home produced hardwood lumber is the active stand taken by Professor Witzel, architect for the Agricultural Engineering Department of the University of Wisconsin, who has shown that for most building uses hardwoods are actually superior to softwoods; and to Fred Trenk and R. W. Abbott of the extension forestry office who have preached the use of home produced lumber at timber harvest field days and other public gatherings.

One often hears that many high quality logs are going into corn cribs, etc., instead of veneer. This is certainly true. From my own experience as a mobile mill operator for the past several years I know that there are a surprising number of veneer logs being cut into farm lumber. However from the farm woodlot owner's point of view there is no financial incentive to sell the logs and buy lumber. The best oak logs plus sawing cost is far below the cost of the poorest hemlock retail price.

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## A New Inventory Stick

Foresters have been fertile minded in devising tools and techniques to expedite field and office work. Volume table and form class data have been put on Biltmore cruising sticks. The 36-inch stick has been shortened so as to carry and handle with greater ease. Folding rules, small enough to fit into a shirt jacket, have been made. Now we have a steel tape rule which will coil into a neat case and can be carried in a small jacket. This type of rule has been long needed by those foresters who have occasional use for a cruising stick and who would like to carry one as they do a jack knife.

In selling woodland appreciation to farmers Soil Conservation Service technicians often use cruising sticks. In the Northeast, Federal Land Bank cruising sticks have been issued to all farm planners. These sticks, used to obtain an inventory of standing trees, have been very effective. They do away with "guesstimates." Farmers recognize them as a desirable tool to their carrying out a wise use harvesting plan.

Soil Conservation Service farm planners have a number of items to carry when going over a farm property. The Land Bank stick was often left in the pick-up because it was cumbersome to carry. Some planners cut them off and attached the shortened stick to the belt where it flopped with every step. Carried thus it, at least, was available when the wooded acreage was inspected and opportunity presented itself to talk to the farmer about woodland values.

To streamline equipment a steel tape rule was prepared. The director of the Northeastern Experiment Station was asked to compile a composite volume table based on an average form class. This was done, and these data were used on the new inventory stick.

It is expected that these steel tapes will be purchased by farmers and forest landowners for their use in inventorying prior to harvesting and to scale logs. Farmers should have such a tool even as they have need for a bushel basket or a scale.

There will be some who will question the accuracy of composite data. Granted that there is likely to be a plus or minus error when there is little or no cull, facts are that 90 percent of the trees in our farm woodlots are the left-overs, and cull percents will run much higher than the percent of tape inventory error due to variable form.

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## Oregon Forest Rehabilitation Program

On July 18, 1949, members of the Oregon State Board of Forestry signed the authorization for the sale of the first issue of Oregon Forest Rehabilitation and Reforestation Bonds. This ceremony, which took place at Owl Fire Camp in the heart of the Tillamook burn, marked the beginning of Oregon's forest rehabilitation program.

In organizing the rehabilitation program each of the three operating divisions in the state forestry department was assigned certain functions.

The research section of the conservation division which has conducted work in direct seeding, tree planting, hazard reduction, and many other projects is continuing its research program to provide new methods and improved techniques. After the creation of a research section, work in direct seeding was conducted by Carwin Woolley and Brice Hammack under the supervision of John B. Woods, Jr.; work has been continued by Dick Berry, Dale Bever, and Jack Gartz.

A new section was set up under the management division to direct the preliminary survey work, overall planning, and aerial seeding for the rehabilitation program.

This planning section is headed by Rudy Kallander, with Jack Hann supervising preplanting surveys, and Lyle Beyers in charge of boundary surveys.

The protection division through its fire protection districts carries out the project activities in the field. A rehabilitation project section has been attached to the northwest Oregon district to handle the project activities in the Tillamook burn. Frank Sargent heads the section under the supervision of Ed Schroeder; Glenn French is in charge of tree planting and aids in fire corridor planning; Bob Reutlinger supervises the corridor layout work; and Curt Nesheim, in charge of fire protection in the district, supervises the additional fire suppression personnel furnished under the rehabilitation program.

Preparatory to any rehabilitation project work three types of surveys are conducted as follows: (1) boundary surveys—to determine the exact location of state owned lands, to re-establish corner markers and to establish necessary boundary markers; (2) preplanting surveys—to determine through intensive analysis of natural stocking, seed sources, cover-types, soil conditions, degree of burn, snag concentration, and topographic condition, the reforestation needs and the adaptability of individual areas to aerial seeding, spot seeding, or hand planting; (3) protection surveys—to determine the need for and to choose the location of access roads, snag free corridors, look-out sites, guard and suppression crew station sites, and to determine the supplementary fire prevention and suppression measures, personnel, and equipment needed to provide adequate protection.

During the 1949 survey season, forest boundary surveys, preplanting surveys, and protection surveys were completed on 28,000 acres in the Tillamook burn. Aerial seeding was completed on 9,700 acres and tree planting carried out on 2,847 acres during the 1949-1950 planting season. Two million Douglas-fir seedlings were used in the planting operations.

Construction on a main north and south combined access road and snag free corridor was begun. Construction was started on a second main east and west snag free corridor. Secondary east and west combined access roads and snag free corridors are being so constructed that they originate from the main north and south break and further subdivide the main body of the burn. Additional secondary roads and corridors will be constructed as the reforestation work progresses. To date, roads and breaks have been constructed through areas that have been seeded and planted, thus insuring the best possible protection from fire. Salvage timber sales were held following access road and snag free corridor construction; consequently, some value has been realized from the establishment of the corridors and the amount of inflammable material on the ground is reduced.

Twenty miles of snag free corridors and 79 miles of access roads have been constructed and maintained. Snag falling has been accomplished by independent contractors who have felled 10,990 snags, and through the operation of state snag falling crews which have accounted for 20,300 snags.

Survey crews have traversed 12 miles of proposed corridors, and snags to be felled have been marked.

Snag free corridors and access roads will be completed beyond the 1950-1951 seeding and planting area prior to the summer of 1951.

A complete survey of the burn has been made with respect to additional lookout sites and guard and suppression crew station sites. The amounts of additional fire fighting personnel and equipment have been determined, and a supplementary fire protection plan set up for the Tillamook burn commensurate with hazard and the increased value of the land following reforestation. Within the next three years, five additional look-outs will be constructed and manned. Quarters, personnel, and equipment will be provided for five fire suppression crews.

A cold storage and tree packing plant has been constructed at the Oregon Forest Nursery at Corvallis to facilitate the storage of tree seedlings for planting and Douglas-fir seed for aerial seeding. At the present time five tons of seed are in storage to insure the continued progress of the rehabilitation program through periods of poor seed years. Experiments concerning storage of tree seed definitely indicate that it can be stored at zero degrees Fahrenheit without any appreciable effect on viability for extended periods of time. Accommodations are also provided in the building for storage of upwards to five million 2-year-old Douglas-fir seedlings in a cold storage room at approximately 35 degrees Fahrenheit.

During the survey season of 1950, preliminary surveys were completed on 10,000 acres in the Tillamook burn and 20,000 acres at Nicolai Mountain in Clatsop county. An area of 7,500 acres has been selected for aerial seeding and approximately 1,000 acres set aside for tree planting in the Tillamook burn area during the 1950-1951 planting season. Aerial seeding will be completed on 5,000 acres and approximately 2,000 acres planted in the Nicolai Mountain area during the same period.

## A Tree Shield to Prevent Skidding Injury

Preventing damage to the reserve trees is one of the problems of intermediate harvest cutting or thinning in young tender timber. In dense stands some trees are damaged in felling; others are injured during skidding. Such injuries may reduce growth, cause defects and decay, or even kill the tree, if severe.

In the second-growth Douglas-fir forests of the Pacific Northwest, special shields have been developed to protect the bases of trees along skid trails. Before skidding starts, a metal guard or shield is placed at the base of the tree in danger, so that when the logs are skidded down the trail, bark is not

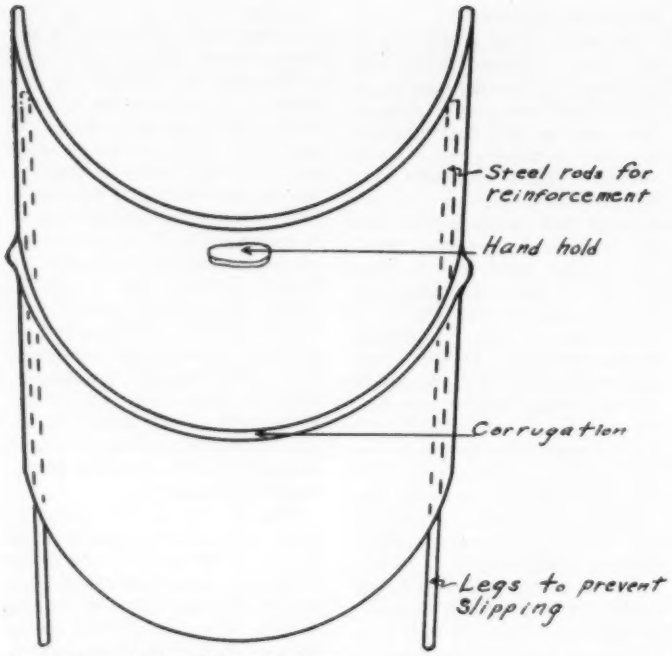


FIG. 1.—Tree shield made from oil drum.

torn from the tree by the pressure and friction of moving logs. Shields are now being used successfully in the light thinning of a 75-year-old Douglas-fir stand on the Mt. Walker area of the Olympic National Forest near Quilcene, Wash. The Puget Sound branch of the Pacific Northwest Forest and Range Experiment Station is cooperating with the national forest, making this thinning a combination timber sale and research project.

The tree shields used on the Mt. Walker sale are inexpensive and easy to build. They were made from 55-gallon oil drums at a cost of $1.50 per shield. One drum supplies material for four shields. The ends of the drum are removed, and the cylinder is cut in half lengthwise with an acetylene torch. Then these two halves are cut across the middle, making four equal pieces. A hand hold is cut at the top of each piece as shown in Figure 1. At each edge of the shield a steel rod about ½-inch in diameter is welded to the drum section. These two reinforcement rods extend below the lower end about 6 to 8 inches to serve as legs. When in use the steel legs are driven into the soil to prevent the shield from slipping around the tree when heavy logs rub against it.

FIG. 2.—Tree shield in place at the base of a tree.

Shields of this type have several advantages. They are light weight, easily carried or transported, and can be compactly nested to take little space; and most important, they are highly effective in reducing damage from skidding. Credit for pioneering this useful device is due to F. W. Kimball, a teamster employed by the contractor, Hill-Lewis Company, to do the horse skidding on the Mt. Walker thinning sale. These tree shields are probably the first of their kind to be used in young stands of timber in the West, but the idea is basically sound and worthy of broad application.

ELMER W. SHAW,
*Pacific Northwest Forest and Range Experiment Station, Portland, Oreg.*

## From a Forester in Korea

*Paul Zehngraff went to Korea in 1949 to head up forest research work. He encountered great difficulty in forest planting because the natives pulled up young trees for fuel before they had an opportunity to grow. He learned of peat deposits in Korea which he was able to exploit for fuel, using methods similar to those applied in Minnesota where he had worked for the U. S. Forest Service for 19 years. When the Red Koreans invaded Seoul, Zehngraff was evacuated to Japan. He recently returned to Seoul. The following letter was written by him on November 16 to Dr. Hardy L. Shirley, assistant dean, The New York State College of Forestry.*

Thank you very much for your stimulating letter which I received in Tokyo October 11, the day before I left for Seoul by Army plane and, of all things, in uniform. (We all are now.) I was among the first reaching Seoul from Japan—pretty much on the heels of the Army, and destroyed Seoul was still smoking. We had to hitch-hike on Army equipment from the airport some 15 miles out. That sounds easy—but it wasn't under the conditions! We made it in 3 hours in 3 different vehicles.

Destruction here is terrific. They say "only" 50 percent of the city is destroyed but that includes the suburbs. Of the heart of Seoul, however, 90 percent is in ashes or

gutted out. The only heartwarming thing during the first few days was the welcome we got from old friends, as well as from complete strangers on the streets. Men, women, young and old, would wish to shake our hands, often with tears rolling—"thank you, thank you!" They have learned now what Communism and the Communists are! The stories one hears are heartbreaking and hair curling. The sights—hunger, lack of clothing, etc.—are heartbreaking enough. The Communists came in to Seoul as a band of the most cruel and heartless kinds of robbers, spread a reign of terror, committing the most unspeakable attrocities, murdering and plundering to their heart's content. When they were driven out, they set the city afire—hiring beggars and children to help them, killing anyone who interfered.

I've found a good share of my old friends and acquaintances still alive after hiding in the mountains over 3 months. Others were either killed or taken to North Korea, particularly the higher ranking officials who didn't get away. My best friend, the bureau chief of forestry, is still missing; his father killed. His wife and children I found a couple of weeks ago selling cigarettes on the streets to buy a little rice; one of the six children, a 12 year old girl, killed.

The word of the U. S. civilians arriving at Seoul spread fast. On the second day one of our faithful servants located me. She'd been in jail under ration of one handful of raw barley a week, cruelly beaten and mistreated. She had managed to save some of Mary's and the children's clothes—and brought them the next day—she was hiding them for our return! Of her own and two children's clothes she had saved none and her house was burned down.

My first assignment is to get fuel for Seoul. We have no transportation facilities. Of the 15,000 trucks before available, 800 are left. Eighty percent of the oxen are killed. I managed to step the peat production up to 49,000 tons in the fall of 1949 and to 250,000 this spring and summer before we left. Of the 100,000 tons scheduled for Seoul, our surveys show that 96,000 are still available and it is my assignment to get it in here. I now have 23 trucks lined up, and yesterday after three weeks of desperate pleadings (and fist pounding) with the different Army branches, U.N. relief, ECA, the various Korean authorities, I finally obtained a weekly allotment. So, peat hauling and distribution starts today! But there are many other tough jobs ahead. I'm afraid there will be very little time for silviculture and forest management for a while. I just pray I'll be given the strength to do what is expected of me—and to do the most good where it is most needed. I'm *not* regretting that I came back! We are quartered in former American houses. We cannot go out after dark, and live on Army rations. The only excitement is the small arms fire on streets at night—bullets have smacked against our house several times after dark, so we turn out the lights!

PAUL ZEHNGRAFF

P. S.—We might have to import large quantities of forest seed. We have not collected any this year, now too late. *Pinus rigida* imported and planted in large quantities by the Japs, does very well here. Who should I contact in the U. S. for large purchases? Approximately what would be the price? Working directly under Donaldson, Tokyo.

## Forestry at Alcorn A & M College

*The first college-level course in forestry at an all-Negro institution was inaugurated at Alcorn A & M College, Alcorn, Miss., in 1950. The purpose and scope of the course is told by Louis Simmons, the first head of the Alcorn Forestry Department.*

July 3, 1950 saw a young man, a recent graduate of Purdue, head south to accept a job to develop a department of forestry at Alcorn A & M College. I arrived on campus and was completely astonished. I saw fertile, brown loam soil, good crops and pasture, modern methods of farming, hardwoods—just like those back home in Indiana—and softwoods of loblolly and shortleaf pine. I learned that the college owns some 980 acres of land, five tractors and a bulldozer, three trucks and a jeep, a prize dairy herd, hogs, 70 head of beef cattle, and flock of 1,000 chickens. This

LOUIS SIMMONS

being my first trip to the South and to an all-Negro institution, I looked for mules, big straw hats, and numerous individuals perched in the shade of their porches in fulfillment of the stories I had heard "up north." Not at Alcorn! Everybody works, from the president down to the 600-odd students. There had been one thing missing—forestry.

Mississippi along with other southern states produces great volumes of timber and forest products. Much of the timber is owned by small Negro farmers and large numbers of Negroes are used in the manufacture of forest products. We as a race know little or nothing of scientific and technical aspects of forestry, the purchaser of "bread and butter" for many a family table. Until the present, opportunities have been extremely limited for Negro youth to obtain scientific knowledge in forestry.

Our main objective here at Alcorn (the only Negro institution in the United States to employ a forester) is to develop and mold our youth to fit into a progressing South—a progressing America.

I am setting up forest plots of hardwoods (oak-gum) and softwoods (loblolly and shortleaf pine). Experiments will be carried out as to the effects of preservative treatments of posts, thinnings in soft and hardwoods, poisoning of hardwoods, pruning, various reproduction methods, and fire control. Courses are to be offered in elements of forestry, management of farm woodlots, dendrology, conservation. Others are to be added until we can offer a major in forestry. All this will take time and effort, coupled with understanding cooperation.

For a substantial percentage of our southern population who heretofore, have not had available facilities, the possibilities are virtually unlimited and the future looks bright for the success of forestry education.

LOUIS SIMMONS,
*Alcorn A & M College,*
*Alcorn, Miss.*

# Points of View

## On the Ecological Approach

Dr. H. L. Shantz's editorial[1] in the October JOURNAL stresses the need for more effective application of ecological knowledge, if major current land management problems are to be satisfactorily solved. But in achieving this emphasis, the editorial overlooks certain phases of the land management problem which may well be coordinate in importance with the ecological ones. The overemphasis is particularly striking in the italicized leader to "The ecological approach to land management." The editorial itself seems more balanced in tone. But because the editorial is colored by this introduction, some of the points made by Dr. Shantz should not pass without comment.

Dr. Shantz says, "Ecology should establish the proper balance of priorities of production." A scale of priorities of any kind can only be established after making value judgments as to the relative desirability of the different lines of production to which priorities are to be assigned. When you establish priorities you are saying A is *better* than B, B *better* than C, etc., and such statements can only be made in terms of some acceptable value standard. It has always been my understanding that ecology was a natural science. As such, it is strange to find it implied that ecology now concerns itself with the problem of value, which by its very nature, involves psychological and philosophical considerations.

Obviously, ecological facts and forecasts are essential *before* reliable value judgments can be made. Only when we understand the ecological alternatives fully will we be in a position to determine priorities wisely. But this is something different from what Dr. Shantz has said.

Repeatedly throughout his article Dr. Shantz implies that economics inevitably implies a "local" and "temporary" point of view. There is never a suggestion that economics may also have reference to long run and national considerations. Since much of economics involves problems of how best to distribute available productive effort over time, it appears that when Dr. Shantz talks about "economics" he means something rather different from "economics" as it is understood by the economist. In its second paragraph the editorial correctly points out that planning should be based on "the needs of the dependent human society," among other things. Economics, by definition, concerns relationships between these needs and the several factors of production (of which the forest is one). Having thus implied that economics provides a part of the foundation for valid planning, are not the author's subsequent strictures against "economic arguments" and the "economic point of view" either unjustifiably broad, or else somewhat inconsistent?

The stone fields in our mountain meadows and the fern patches which have supplanted virgin forests are all too frequent monuments to man's failure to take maximum long run advantage of his environment. But to infer as Dr. Shantz does that these sore spots all developed with the support of "economic arguments" is to make no discrimination between good economic judgment and bad economic judgment. The guides to judgment in the economic field are far from reliable and opportunities for major mistakes in judgment are therefore common. But is not this an argument for more and better study of economic aspects of our problems, rather than a basis for rejecting what economics may have to offer?

Nor can all of the mistakes, either past or present, be laid to the door of faulty economic judgments. The economist and business man must take as data for their problems information supplied by the ecologist and other natural scientists. One of the big problems the practicing forest economist faces today is the inadequacy of the available means for forecasting the probable behavior of the forest under specified alternative conditions. Without such information the economist cannot even begin his task. As an example there seems to be a current vogue for regard-

[1] Shantz, H. L. The ecological approach to land management. Jour. Forestry 48: 673-4. 1950.

ing many of our pressing forestry problems as "economic" ones. Yet the economist who attempts to study them often finds that he cannot even begin his analysis until great gaps have been filled in our knowledge of how the resource will respond to specific treatments. In his comments on the redwood region, Dr. Shantz might well have pointed out that many landowners there may be currently rather perplexed by conflicts of opinion between presumably qualified scientists as to the actual ecological effects of certain kinds of treatment of the cover. Such perplexities are hardly the fault of economics.

Similarly, the editorial lesson from Greek history suggests not that Greek civilization was unduly swayed by the desire for a few more pounds of beef, but rather that the ancient Greeks knew less about the ecology of their resources than they should have known.

Dr. Shantz has said so many wise things in his editorial that it is the more disturbing to find them so narrowly interpreted. "Everything in nature is linked together and every factor or organism, no matter how feeble, affects some other factors or organisms." If we include human beings among the organisms in question, and if we note that psychological effects are involved, as well as physical and biological ones, what a beautiful statement this is of the basic nature of the economy! The ecologist with his grasp of community concepts and awareness of the variety of forms which interrelationships between individuals may take, should be among the first to recognize the importance of studying human beings in relation to the problem of production (i.e., economics). I fully agree that "synthesis requires an intellect backed by broad training and experience if it is to grasp the significance of the details to the whole." But the training and experience will not be broad enough if it chooses to ignore those aspects of value of psychology which are the province of economics.

The problems of land management require a consideration of *all* the factors which affect land use. Some of these factors are ecological and Dr. Shantz is right in emphasizing our need both to know more about them and to apply our knowledge more fully. But so long as men use scarce resources, other equally relevant factors will be economic. It is wrong to imply that these factors can be ignored. Our land management will only improve to the extent that we better our understanding of the problem as a whole and of the interrelationships which exist among all the elements which are involved. Progress in the direction of such improved understanding will not be fostered by setting up any single group of factors, whether ecological or economic, as the only ones which are "safe" guides to judgment. Nor will it do to suggest that men can be led to better use of resources without considering all of the things which motivate them in such use.

HENRY J. VAUX,
*University of California,*
*School of Forestry,*
*Berkeley.*

# Reviews

## Water, Land, and People

By Bernard Frank and Anthony Netboy. 331 pp. Illus. Published by Alfred A. Knopf, New York. 1950. $4.

When the editor of the JOURNAL OF FORESTRY asked me to review this book, he doubtlessly was aware of my being right in the middle of the "water, land, and people" problem as a member of the Tennessee Valley Authority staff. It would be difficult, however, to find a completely objective reviewer of such a comprehensive book, which hauls into its court practically every federal and state agency charged with responsibilities in this complex field. *Water, Land, and People* is an assault upon atomistic approaches to an inherently unified problem; namely, how to achieve optimum use of the combined land and water resources of our nation. An excellent background section presents in lay language the ecological web of weather, water, soil, cover, and stream flow. Placed alongside this is the sorry historical record of how industrial man has tried to reap his harvest without respecting the fundamentals of sound and balanced resource development. This portion of the book is well documented, has a swift-moving narrative, and is accompanied by pictorial sections that graphically support the story. Three appendices cite nearly 200 references, list over 100 bibliographic sources, and designate the major journals and physical research centers.

Here and there the authors employ prose bordering on that of some of the better known conservation alarmists, but generally they succeed in getting difficult points across without semantic perversion of technically acceptable standards. This book maintains a perspective altogether too uncommon in most of the technical and specialized literature recently produced in the forestry, agriculture, flood control, and "conservation" fields.

In rapid succession the authors apply their integrated watershed development point of view to the most important approaches currently in vogue. Here they lay about them with a heavy shillelagh and administer a rough drubbing to such giants as the Army Engineers, the Reclamation Service, TVA, and parts of the USDA such as the PMA. Generally, the reader gets the impression that chaos reigns; that little effective work is being done in the field of water control on the land; and that our water tables shall continue to sink and reservoirs fill with silt unless remedial action is taken immediately. Emphasis is placed upon the bureaucratic warfare that obscures the interests of the general public, resulting in lopsided development and in frustrating the many for the satiation of the few. Whether or not their remedy for this malady—the re-creation of a National Resources Planning Board or its equivalent—would ameliorate inter-agency feuding will probably be an open question for many readers of this book, especially those who doubt that the remedy for over-centralization is more of the same. Integration, as the authors' examination of TVA tends to imply, can be brought about without the blessings of high level Washington master minding.

TVA, according to the standards set up by Frank and Netboy, is dominated by engineering approaches to water control, and they naively recommend plowing its electric power revenues back into the "unfinished business" of land development and soil conservation, ignoring completely the legal and just obligation that TVA has to return to the federal treasury every penny invested in power facilities. Here the lament centers upon the fact that TVA has not been able, in 16 years, to convert the Tennessee basin into a land of milk and honey. TVA suffers, in the eyes of the authors, from a lack of "aggressiveness." This is a surprising conclusion from authors who state "a change in cultural patterns" is involved and who recognize the central role which education has in this process—at least in democracies. In their assessment of TVA, and the alleged lack of symmetry in its resource development program, the authors failed to grasp the singularly important point that TVA operates in the Tennessee basin as a partner, not as an exclusive agent. The catalytic function of a valley authority is scarcely mentioned, despite the fact that many persons feel that this function is the missing ingredient which blocks integration of resource use programs in other basins, such as the Missouri and Columbia. Chapter X concludes this volume with a stirring appeal for owner responsibility in resource use, coupled with recommendations for action designed to either change or contain the socially "irresponsible" elements in the resource owning segment of our population. After a plug for more knowledge and wider diffusion of it through educational channels, Frank and Netboy get into the meat of their proposed solutions. The November 1949 Supreme Court decision upholding the Washington State forest practices law is cited as a hopeful straw in the wind. Then, in sequence, they advise that (1) "The United States is far behind some European countries like Denmark, Norway, and Switzerland. . ." (2) "To stop the misuse of our watersheds will require such controls of rural private property as have not yet been undertaken. . ." (3) "In essence, the application of social controls to rural land use would be no more than an extension of regulations imposed upon urban property owners. . ." (4) "In a country that fully valued its natural resources,

citizens would subject themselves to a system of penalties for mishandling their lands. . ." (5) "We should give serious consideration to legislation that would permit the states—and the Federal Government—to sue private owners or operators who injure their lands or pollute or otherwise impair stream flow. . ." (6) "An important means of safeguarding the public interest in the land is the extension of public ownership."

Although taken from context, the above excerpts fairly indicate the direction in which the authors would have us go. Not only the private landowners require disciplining, however, for "protection of the public welfare demands a new and centralized agency that will guide the activities of federal bureaus . . . (vested with) authority to approve or veto programs submitted by the bureaus." The assumption seems to be that when and if the land deteriorates sufficiently, the foregoing degree of centralized regulatory control will become "socially acceptable."

I would be less than candid if I failed to state that another school of thought exists, a vigorously growing school, which advocates an approach radically different from that of the authors. History will have to decide whether *Water, Land, and People* was, in this respect, with or against the tide.

HOWARD E. BALL,
*Tennessee Valley Authority*
*Knoxville, Tenn.*

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**Mycotrophy in Plants**

By Arthur P. Kelley. xiv + 223 pp. Illus. Chronica Botanica Co., Waltham, Mass. 1950. $4.50.

Mycotrophy is concerned with the relation of fungi to other plants where this relation is considered to represent some form of mutualism. Dr. Kelley's monograph on mycotrophy is a comprehensive review and synthesis of the published material on this subject and fills a long-felt need for a complete survey of this very complex and difficult subject. It should prove very useful for those working in this field and is required reading for students contemplating such work. The casual reader may find it difficult to gain a clear concept of the precise nature and importance of mycotrophy, partly because of the organization of the book, partly because of rather poor illustrating, but largely because there is a great need for more careful and comprehensive experimental work to clarify some of the concepts involved.

Foresters will be particularly interested in the *mycorrhizae* (fungus-roots) of trees and the larger part of this book is concerned with mycorrhizae of plants. The author, however, discusses other forms of mycotrophy including *mycorrhizomes*, associations of fungi with rhizomes of such plants as ferns and orchids; *mycothalli*, fungi in association with the gametophytes of liverworts, ferns and lycopods; *mycodomatia*, the fungus-chambers found in certain roots; and *mycocaryopses*, the fungus-seed association exemplified by species of *Lolium* and *Calluna*.

The importance of mycorrhizae to forestry has been emphasized by failures in growing coniferous seedlings in nurseries, and in afforestation. A survey of the occurrence of mycorrhizae (Chap. II) and the distribution of mycotrophic plants (Chap. V) demonstrates that the mycorrhizal habit is extremely widespread in nature. The author stresses the need for systematic study stating ". . . botanists are in a position of ignorance, for they do not know what sort of root endings exist on the majority of plants in their natural haunts." "If root-hairs predominate in nature, then physiological research should be directed chiefly to root-hair plants; but if mycorrhizae predominate, then plant physiology should be concerned chiefly with mycorrhizae." ". . . there is enough evidence at hand to indicate the mycorrhizae predominate over root-hairs in the majority of cases." "No major group from 'Thallophyte' to Spermatophyte is excepted" from the mycotrophic habit.

The fungi that form mycorrhizae are considered in Chapter III, fossil mycorrhizae in Chapter IV, the environment of mycorrhizae and mycotrophic plants in VI, and the structure of mycorrhizae in IX.

Various theories regarding mycotrophy are taken up in Chapter XI. A viewpoint of the parasitism school is stated by Burges. "The presence of a fungus in a mycorrhizal association is to be regarded as an example of controlled parasitic attack and has no mutualistic significance. The fungi are weak pathogens whose activity is curbed by the reactions of the host-cells."

"Those who reject the parasitic view of the mycorrhizal symbiosis —although divided into several divergent schools of thought—all agree that the mycorrhizal fungi are useful to the higher plant. . . ." The beneficial effects may arise in various ways. (1) The fungal hyphae may be digested by the root cells (mycophagy) and furnish proteins and other substances. (2) The mycorrhizae may replace root-hairs in the absorption of water and nutrients. (3) The fungal hyphae transfer organic nitrogen from duff and humus to the host. (4) The mycorrhizae enable the plant to obtain larger supplies of N or P and other mineral nutrients due to increased surface area for absorption and increased rates of root metabolism. (5) The fungus supplies the higher plant with carbohydrates, fats, and oils. (6) The fungus secretes growth-promoting substances which stimulate the host.

The final chapter considers the relation of the fungus to the higher plant and concludes that the fungal endophyte is largely limited to the area outside the stele and "is kept from all places where active physico-chemical processes occur—by what has been aptly called a brutal phagocytosis" (digestion of the fungal hyphae). Nevertheless the mycorrhizal relationship appears to be one of obligate symbiosis (Chapter X) in which both partners benefit and the author states that while it is possible to grow mycotrophic plants without their fungal partners ". . . there is a *natural* view of obligatism by which we perceive that the

vast majority of plants in nature are obligatorily mycotrophic thru their physiological requirements in a limited environment."

This book is a natural outgrowth of the author's mimeographed *The Literature of Mycorrhizae*. He is to be complimented on the completion of a difficult task.

A. L. McCOMB,
*Iowa State College,*
*Ames.*

**Management of Natural Slash Pine Stands in the Flatwoods of South Georgia and North Florida.**

By R. D. McCulley. 57 pp. Illus. Circ. 845, U. S. Dept. Agric. U. S. Government Print. Off., Washington 25, D. C. 1950. 20 cents.

This discussion brings together the results of research and best thinking on the management of this southern yellow pine species of constantly increasing importance within its range. In the region covered, the northern variety of slash pine, called by recent studies *Pinus elliotti*, is meant. *Pinus caribaea* is reserved by these writers for the south Florida form of slash pine, which is an inferior tree in growth and reproduction habits. It is not the tree covered in this circular. This difference could well have been explained in the introduction.

The common integration of naval stores gum and wood production and some minor grazing, is discussed. Pre-commercial and commercial thinnings are described—the former to leave 600 to 800 trees per acre. The latter (in the first commercial cut) to take 30 to 50 percent of the volume in crowded stands (obviously less is the stands that are not over-crowded). A guide in thinnings is to keep the crown vigorous at 35 percent of the stem height. One cord per acre and year can be produced with good stocking. An annual growth of 250 board feet per acre in addition to naval stores is attainable in a 60-year rotation in the flatwoods type.

In naval stores operations, thinnings may be cupped when of operable size on a selective cupping basis. But enough round trees should be left for a final naval stores cupping just before final cutting in a timber rotation.

Prescribed burning for protection is recommended, but only after needed young growth is 12 to 15 feet high. This may mean complete protection for 5 to 10 years on reproduction areas. Burning is generally best done between December 15 and February 15, against steady 3 to 10 mile northerly winds, from recently plowed fire lines 10 chains apart (east and west). Fire is a dangerous tool in untrained hands.

Reproduction is rather readily obtained from 2 to 4 round seed trees 10 inches or more in diameter.

The circular is well written and covers its field excellently. With a brief discussion of the southern form of slash pine added, and nursery and planting practices and results included, it could have readily been expanded on a complete manual for the handling of slash pine, as far as present experience goes.

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**Erosion Then and Now.**

Published by American National Livestock Association. 28 pp. Illus. Amer. National Livestock Assoc. Denver, Colo. or Sheridan, Wyo. 1950.

This pamphlet is a most amazing document. In 28 small pages including illustrations, it tries to brush aside convictions and beliefs held by the majority of this country's top flight scientists and conservationists. It totally ignores the thousands upon thousands of personal observations, purposeful experiments, and fully authenticated research upon which these convictions are based.

For the greater part the pamphlet is composed of brief extracts from the writings of early explorers, military expeditions, and more recent speeches, reports, and articles by government officials, college professors, and others. Some of these quotations from modern sources are sharply challenged by contemporary writers and are not accepted by many conservationists. Other quoted extracts cover recorded observations and statements of fact which are not in dispute but have little apparent application to modern land use problems.

Cleverly written, the pamphlet uses these quotations as a spring board for broad generalizations which are intended to justify the current grazing practices of the western range livestock industry and as a denial of the land abuses charged to that industry.

In substance it holds that erosion is a fundamental and continuing natural process operating independently of human activities and any effective control by man is impracticable except at enormous cost out of all proportion to the benefits derived.

The writers draw no distinction between geologic erosion, whose slow but inexorable progress is generally admitted to be uncontrollable by man, and accelerated erosion definitely traceable to man's activities. In view of the overwhelming evidence that man's use of the earth's surface has caused terrific erosion within an incredibly short time, it is apparent that the authors have carefully dodged the nub of the whole erosion problem.

In the same manner the pamphlet emphasizes the value of silt deposition by flooded streams in building fertile bottomlands, implying that such beneficial aspects of erosion largely offset its detrimental effects. No mention is made of the tragic and well documented fact that incredible quantities of top soil from farm lands and grass lands have been moved out of place and now form unusable mud and sand bars which are moving steadily toward the sea. So far, no authorities have proved that such displaced top soils have useful values comparable to those possessed by top soil in its original location.

The pamphlet devotes much

space to quotations from narratives of early historians and explorers to show that western range lands, before the coming of the white man, were subject to wet periods and periods of extreme drought and that the streams carried heavy silt loads during periods of active runoff. Using these historical facts, which are quite generally accepted as being accurate and uncolored, the writers state that domestic livestock on the range today faces the same weather hazards and the same wide fluctuations in grass production. Thes vagaries of climate are cited as justifying, in fact compelling, the overgrazing of range lands during drought periods. From the same historical evidence the writers claim that wild game on the plains was numerically far more abundant than present day domestic stock and that the game herds were also forced to overgraze during dry periods and that this happened for thousands of years without causing erosion or any permanent damage.

In presenting these arguments the writers do not take into consideration the fact that the buffalo herds were not under fence and were free to move at will from local drought areas to regions of better grass, which conceivably would be easier on land and grass than if the same animal populations were confined to restricted areas. Even so, the old narratives strongly indicate that considerable erosion was caused by wild game and the prevalence of silt loads in the Missouri river which ran through the heart of the buffalo range is certainly significant. Nevertheless, the degree to which the buffalo range stood up to grazing before the advent of the white man, while interesting historically, is hardly pertinent to the modern livestock economy and a wholly different pattern of land use.

The booklet claims that much overgrazing by livestock, necessitated by the fact that drought periods are both unpredictable and inescapable, does no permanent damage and causes no erosion. This argument is based upon the point that native grasses are the result of ages of natural selection in producing plants that will withstand both grazing and drought and that ranges apparently hopelessly and permanently barren in dry years will bloom again in wet years.

It should be perfectly obvious to any reader that the heart of the matter depends upon the *degree* of overgrazing. Overgrazing for a year or two which merely uses surface vegetation and leaves root structures undisturbed is an entirely different matter from long c o n t i n u e d overgrazing which changes vegetative types, destroys root anchorages, and leaves soil exposed to wind and water action. The authors do not go into such details but imply broadly that the whole matter of overgrazing and erosion has been over emphasized and exaggerated.

The booklet claims that no sane cattle producer would deliberately abuse his land or his leased pastures to his own detriment and quotes from other writings to the effect that the rancher is vitally interested in the constructive conservation of forage as his livelihood depends upon the maintenance of a normal growth of forage.

Except for the admission that some stockmen overstocked the ranges in the '80's and that in later times some cattlemen were obliged to overgraze in dry years, the booklet says little about the overgrazing that has actually occurred. The reader is left with the implication that overgrazing just does not occur because this is contrary to the operator's own interests.

The western range states, and this includes the range lands of Texas, offer innumerable examples of destructive grazing of *privately* owned range lands by their owners. The records of the U. S. Forest Service are replete with documented examples of the destructive use of leased public forest range lands by permittees. Leases of state owned grazing lands reveal too many cases of abusive grazing, shocking in certain instances, to subscribe to the idea that public leases are always safe guarded in self-interest. In the western states today there are extensive areas where the water table has been lowered, top soil washed away, and extensive gullying developed on public domain lands where the only use has been livestock grazing. This destruction has occurred within the memory of living men. It is impossible to reconcile these known facts with the generalities stated in the pamphlet.

Turning now to the question of controlling erosion through the regulation of grazing, the pamphlet gives a number of quotations from writings of various people and states, "There is nothing in the findings of the different agencies which have been quoted in the foregoing pages from which it could be concluded that erosion could even be retarded by restricted grazing or non-use of grazing lands."

It is impossible to consider such a statement seriously in view of the mass of evidence where restricted grazing or non-use has practically stopped all erosion. Here again the records of the U. S. Forest Service give incontrovertible testimony that the conclusions of the authors are unwarranted and tragically inaccurate. Tragic, because such an ostrich-like attitude towards soil and vegetative resources augurs ill for future generations who will need both soil and grass.

The wide discrepancies between the conclusions or opinions stated by the authors and the overwhelming physical evidence on the ground indicates that the pamphlet is intended as a smoke screen for western range practices rather than a serious contribution to sound land use planning.

In considering the apparent purpose of this pamphlet it is not amiss to recall that less than four years ago, legislation was introduced in the Congress through the efforts of influential western stockmen to turn over the federally owned grazing lands to private ownership. This included grazing lands within the national forests and the national parks as well as

the public domain.

In its concluding paragraphs the pamphlet indicates that modern cattlemen are willing to sit down and discuss their range and land use problems with sound conservationists and other interested groups. This is the only constructive suggestion made by the authors and it is hedged with emphasis upon using a "practical approach" and reiteration of the need for using grass in producing meat at a reasonable cost to the consumer.

Nevertheless, only in such a meeting of minds is there any hope. Whenever the western stock industry is willing to admit honestly the existence of over grazing and erosion and to recognize that both are preventable if met with planned action, instead of denials or evasive words, the range problem can be set up and solved.

After all the American public has the right to expect and to demand that the stockmen, the conservationists, and the land managers get together and this right soon. This to the end that all range lands, public and private, be devoted to the fullest possible production of meat consistent with other legitimate uses of such lands, and provided always that the productive top soils are kept in place.

The top soil layer of this country upon which our lives and our prosperity depend is so thin and so easily damaged that we who are responsible to the next generation, simply cannot fool around with excuses, platitudes, and half promises from any industry whose current practices threaten this soil skin.

JOHN W. SPENCER,
*Santa Rosa, Calif.*

**Waldbau (Silviculture).**

By Dr. Josef Köstler. 418 pp. Illus. Paul Parey, Berlin Süd-West 68, Lindenstrasse 44.

The author, Josef Köstler, is or should be well-known the world over as the late director of the International Forestry Center established in 1936 at the second World Forestry Congress in Budapest.

Köstler, the son of a forester, who has grown up in the woods, is more than a forester. He alone, among all foresters in the world, holds three doctor degrees namely that of philosophy, that of law, and that of natural sciences.

His present book on silviculture is evidence of his unbelievable versatility, experience, and memory for facts and for literature. No topic in all forestry is more difficult to treat in a textbook than is silviculture: For the reason that Einstein's law of the relativity applies not merely to the stars but also to silviculture. What is right today and here is wrong anywhere else and at any other time.

Thus, necessarily, a textbook on silviculture cannot have any universal character. It is but natural that Köstler preparing a textbook for his students in Munich is forced to limit its scope to German performances. There is a wealth of information pressed together on a few pages. Naturally, the most interesting section is that on forest types and their modes of regeneration which has been subject to changes as much as if they were Paris modes of woman's dresses. Köstler has succeeded in bringing order into this chaos and to show the possibilities of the various systems as well as the exaggerations of their merits as made by their sponsors.

For the Germans, Köstler's book is particularly timely: A revolution in silviculture is in the making—a revolution doing away with the very term "rotation", the "gradation" of age classes, yea, even with the term "thinnings" to which the experiment stations have given so much time and attention for over 100 years. Shall we dread a revolution in silviculture or shall we exclaim with the French: "Vive la Revolution"?

C. A. SCHENCK,
*Lindenfels, (Odenwald), Germany.*

# Current Literature

*Compiled by* MARTHA MEELIG, *Librarian, The New York State College of Forestry*

*Range Management Section Compiled by* FRANCES FLICK, *Library, U. S. Department of Agriculture*

### General

*Challenge of the Wild.* By Kenneth Gilbert. 252 pp. Superior Publ. Co., Seattle 11, Wash. 1950. $3.

*The Everglades.* A List of Selected References in the Library, Florida State University, Tallahassee. Comp. by Florence Bethea. 11 pp. Florida State Univ. Mimeog. 1950.

*The Fernow Experimental Forest, Parsons, West Virginia.* By S. Weitzman. 16 pp. Northeastern Forest Expt. Sta., Upper Darby. 1949.

*My Neck of the Woods.* By L. D. Rich. 255 pp. J. B. Lippincott, Philadelphia. 1950. $2.75.

*Palm Trees in the United States.* By M. L. Bomhard. 32 pp. Illus. U. S. Dept. of Agriculture, Washington 25, D. C. AIB No. 22. 1950. 15 cents (Govt. Print. Off.).

*The Tropical Rain Forest.* By P. W. Richards. 450 pp. Illus. Cambridge Univ. Press, New York 10. Fall, 1950.

*Two Captains West; An Historical Tour of the Lewis and Clark Trail.* By Albert and Jane Salisbury. 256 pp. Illus. Superior Publ. Co., Seattle 11, Wash. 1950. $7.50.

### Conservation

*The Pursuit of Plenty: the Story of Man's Expanding Domain.* By A. G. Mezerik. 203 pp. Harper Bros., New York 6. 1950. $2.

### Farm Forestry

*Forest Practice Standards for New Hampshire Woodlands.* 16 pp. Illus. Univ. of New Hampshire, Durham. Ext. Bul. No. 98. 1950.

*Notes on Estate Forestry.* By N. D. G. James. 75 pp. Basil Blackwell, Oxford. 1949. 3s. 6d.

*Woodlot Economics on Vermont Dairy Farms.* By R. M. Carter. 24 pp. Vermont Agric. Expt. Sta., Burlington. Bul. No. 554. 1950.

### Forest Management

*Revised Yield Tables for Japanese Larch in Great Britain.* By F. C. Hummel. 15 pp. H. M. Sta. Office, London. Great Britain For. Comm. Forest Record No. 1. 1949. 6d.

### Forest Resources

*The Forest Resource of Carlton County.* By Lynn Sandberg, A. G. Horn, and P. C. Guilkey. 50 pp. Illus. Office of Iron Range Resources and Rehabilitation, St. Paul 1, Minn. 1950.

*The Forest Resources of Clearwater County.* Same. . . 59 pp.

*Natural Landscapes of the United States.* By J. F. MacBride. 47 pp. Illus. Chicago Natural History Museum, Chicago, Ill. Popular Series. Botany No. 27. 1950.

### Pathology

*Blister Rust—Scourge of Sugar Pine.* 16 pp. Illus. Calif. Div. of Forestry, Berkeley 4. 1950.

*Cull Factors for Forest-Tree Species in Northwestern California.* By J. W. Kimmey. 30 pp. Calif. Forest and Range Expt. Sta., Berkeley. Forest Survey Release No. 7. Mimeog. 1950.

*Dying Elms and Oaks in Indiana.* By R. M. Caldwell and J. J. Davis. 11 pp. Purdue Univ. Agric. Ext. Serv. Lafayette, Ind. Ext. Leaflet 307. 1950.

*Oak Wilt in Wisconsin* By J. E. Kuntz and A. J. Riker, 9 pp. Illus. Wis. Agric. Expt. Sta., Madison. Stencil Bul. No. 9. 1950.

### Protection

*How to Get County Forest Fire Protection; Florida's Legal Requirements.* 4 pp. Illus. Florida Forest Serv., Tallahassee. Cir. No. 7 rev. 1950.

### Range Management

*Arizona Range Resources. II, Yavapai County.* By R. R. Humphrey. 55 pp. Illus. Map. Ariz. Agric. Expt. Sta., Tucson. Bul. No. 229. July, 1950

*The Climate of the Central North American Grassland.* By J. R. Borchert. Assoc. of Amer. Geographers. Lancaster, Pa. Annals, Vol. 40, No. 1, pp. 1-39. Illus. March, 1950.

*Glossary of Botanical Terms Commonly Used in Range Research.* Compiled by W. A. Dayton. 41 pp. Illus. Supt. of Docs., U. S. Govt. Print. Off., Washington 25, D. C. U. S. Dept. Agric. Misc. Pub. No. 110. Revised, June, 1950. 20 cents.

*Seedling Stands from Airplane Broadcasting of Pelleted and Unpelleted Seed in Southeastern Utah.* By A. T. Bleak and T. A. Phillips. 14 pp. U. S. Forest Serv., Intermountain Forest & Range Expt. Sta., Ogden, Utah. Research Paper No. 22. August, 1950.

*Stabilization of Midwestern Grassland.* By J. E. Weaver. Ecological Monographs, Duke Univ. Press, Durham, N. C. Vol. 20, pp. 251-270. July, 1950.

*Western Stock Ranching.* By M. H. Saunderson. 247 pp. Illus. Univ. of Minnesota Press, Minneapolis. 1950. $5.

### Silviculture

*Bark Thickness of Lodgepole Pine.* By H. A. Parker. 2 pp. Canada Forestry Branch, Ottawa. Silv. Leaflet No. 49. Mimeog. 1950.

*Improvement Cutting in a Mixedwood Stand.* By E. G. Daly. 4 pp. Canada Forestry Branch, Ottawa. Silv. Leaflet No. 46. Mimeog. 1950.

*Severe Thinning in an Overstocked Lodgepole Pine Stand.* By J. Quaite. 2 pp. Canada Forestry Branch, Ottawa. Silv. Leaflet No. 47. Mimeog. 1950.

*Soil Factors Related to the Local Determination of Forest Site Quality; A Review of Literature.* By E. M. Gaines. 28 pp. Southern Forest Expt. Sta., New Orleans, La. 1949.

*Strip Thinning with Tractor Winch, Saskatchewan.* By M. Kastrukoff. 2 pp. Canada Forestry Branch, Ottawa. Silv. Leaflet No. 48. Mimeog. 1950.

*Tree Growth and Rainfall—A Study of Correlation and Methods.* By W. S. Glock. 47 pp. Smithsonian Inst., Washington 25, D. C. Misc. Collections Vol. 3, No. 18. 1950.

### Wildlife Management

*The Way to Game Abundance.* By W. B. Grange. 365 pp. Charles Scribner's Sons, New York 16. 1950. $6.

### Wood Technology and Utilization

*Inventory of Unused Wood in District 6, Lewis County.* 24 pp. Illus. Inst. of Forest Products, Seattle 5. Bul. No. 7. 1950.

*Sculpture in Wood.* By John Rood. 179 pp. Illus. Univ. of Minnesota Press, Minneapolis 14. 1950. $5.

*Tree Poisoning Facilitates Bark Removal.* By R. G. DeMoisy. 4 pp. Illus. Inst. of Forest Products, Seattle, Wash. Cir. No. 9. 1950.

*Wood Structure in Relation to Growth of Beilschmiedia Bancroftii Bailey and White.* By G. L. Amos and H. E. Dadswell. 19 pp. Illus. Forest Products Laboratory, 69-77 Yarra Bank Rd., South Melbourne, Australia. 1950.

# Society Affairs

*Compiled by* ROBERT D. HOSTETTER, *Assistant Executive Secretary*

**Officers and Members of the Council, 1950-1951**

CHARLES F. EVANS, *President*
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Atlanta, Ga.

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State Department of Conservation
Lansing 12, Mich.

GORDON D. MARCKWORTH
College of Forestry
University of Washington
Seattle 4, Wash.

EARL PORTER
Southern Kraft Division
International Paper Company
Mobile 9, Ala.

## Vote Establishes Student Grade

### Junior Requirements Simplified Affiliate Grade Expanded

Effective December 1, 1950, as a result of a vote by the membership, a Student grade was established in the Society.

Junior and senior students enrolled in approved curricula at accredited forestry schools are eligible for election as Student Members if their applications are endorsed by three voting members. Graduate students not eligible for the Junior grade are also eligible for election to the Student grade.

Dues for the Student grade are $3.00 per year and include subscription to the JOURNAL OF FORESTRY. Student Members who apply for advancement to the Junior grade during the calendar year in which they graduate shall not be charged Junior Member dues for that year nor shall they be charged the usual $5 admission fee.

Student Members are allowed to participate in Section, Chapter, and national activities of the Society but cannot vote.

Student subscriptions to the JOURNAL OF FORESTRY are still available at the established rate of $3.00 per year. Any students, regardless of the institution they attend or the curricula they study, are eligible to take advantage of this special rate.

The simplified bylaw defining requirements for admission to the Junior grade limits candidates to two classes:

Class A candidates who are graduates of approved curricula in accredited schools; or

Class B candidates who are Affiliate Members with two additional years of qualifying experience since being elected to that grade.

Previously, there were seven classes in which candidates could apply for Junior Membership.

The requirements of the expanded Affiliate grade, which also went into effect on December 1, 1950, now provide that graduates of non-accredited forestry schools who have completed a curriculum containing the five basic professional courses are eligible to apply for Affiliate Membership. Persons with a combination of qualifying forestry experience and education totaling at least six years are also eligible to apply for Affiliate Membership.

A tellers committee of Jesse Buell, Chas. M. Genaux, Frances J. Flick, Robert C. Heller, and James P. McWilliams on December 2 certified the following tabulation of votes:

**Amendments to the Constitution**

| | Approved | Not approved | Not voting |
|---|---|---|---|
| Article III | | | |
| Sec. 1 | 2,436 | 597 | 21 |
| Sec. 2 | 2,315 | 709 | 30 |
| New Sec. | 2,226 | 773 | 55 |
| Sec. 3 | 2,700 | 329 | 25 |
| Article IV | | | |
| Sec. 1 | 2,364 | 652 | 38 |
| Sec. 2 | 2,356 | 630 | 68 |
| Article V | | | |
| Sec. 1 | 2,322 | 671 | 61 |
| Sec. 2 | 2,191 | 791 | 72 |

A total of 3,089 ballots were returned, of which 35 were invalid.

Republished below are the amended portions of the Constitution and pertinent Bylaws which were adopted provisionally by the Council at its June 1950 meeting.

### Student Members

**Article III, Section 1**

The membership of the Society shall consist of Junior Members, Members, Fellows, Affiliate Members, Associate Members, Student Members, Corresponding Members, and Honorary Members.

**Article III, Section 2**

Members and Fellows shall be at the time of their election citizens of the United States, its possessions, or Canada. Student Members, Affiliate Members, Junior Members, and Associate Members shall be, at the time of their application for membership, citizens of the above-mentioned countries or shall have declared, in a legally accepted manner, their intention of becoming citizens.

**Article III, Section (new)**

Student Members shall be junior or senior students, or graduate students not eligible for the Junior Member grade, regularly enrolled in approved curricula at accredited schools of forestry.

**Article IV, Section 1**

All admissions or reinstatements to the Society, and advancement from the grades of Affiliate or Junior Member to a higher grade shall be by vote of the Council.

For candidates for reinstatement, for candidates for Junior Membership who are graduates of schools of forestry approved by the Council, and for candidates for Student Membership who qualify for this grade as defined in Article III (new) Section above, said Council may delegate this authority to the Executive Secretary.

**Article IV, Section 2**

Nominations for all grades of membership except Junior Member, Student Member, Corresponding Member, Honorary Member, and Fellow shall be endorsed by a Section of the Society except for candidates not residing within the territory of any Section, when they shall be endorsed by three Members or Fellows; and shall be submitted in writing, with complete evidence of qualifications, to the Executive Secretary.

Nominations for Student Membership for

candidates who meet the qualifications for this grade shall be endorsed by three voting members of the Society who are on the faculty of the institutions in which the candidates are enrolled.

Nominations for Junior Membership for candidates who are graduates of a school of forestry approved by the Council shall be endorsed by three voting members of the Society or by a Section and shall be submitted with evidence of such graduation to the Executive Secretary.

Nominations for Junior Membership for candidates who are not graduates of a school of forestry approved by the Council shall be endorsed by a Section of the Society and shall be submitted with complete evidence of education and practical experience to the Executive Secretary.

Immediately upon a Junior Member's fulfillment of the requirements for Member, the Section in which he is domiciled may nominate him for the higher grade. A Junior Member who, at the expiration of six years, has not been nominated by a Section for the grade of Member, and who is actively engaged in forestry work, shall automatically become a Member unless his advancement is protested on the basis of lack of competence or for other reasons and the protest is sustained by the Council.

Annually, the Executive Secretary shall notify each Section of every Junior Member in its territory who is completing his sixth year of membership, and shall request a report on him and an endorsement if he is eligible for Member. Instances of questionable eligibility shall be referred to the Council, which body shall interpret the phrase "actively engaged in forestry work" in doubtful cases. Thus those who have been Junior Members for six years, who are actively engaged in forestry work, who have had three years' experience in forestry, and whose advancement is not protested on grounds of competence or for other reasons, shall be certified as full Members by the Council.

**Article V, Section 1**

An admission fee of $5 shall be assessed upon original election to membership, but shall not be assessed for advancement to higher grades or for election to the grades of Student Member, Corresponding Member, and Honorary Member.

**Article V, Section 2**

Annual membership dues shall be as follows:

For Fellows, $15.

For Members, $12 for their first six years in this grade; $15 thereafter.

For Junior Members, $6 for their first three years in this grade; $9 for their second three years in this grade; $12 thereafter.

For Associate and Affiliate Members, $6.

For Student Members, $3.

**Bylaw (new)**

Requirements for Student Grade: Junior, senior, and graduate students regularly enrolled in approved curricula at accredited schools of forestry are eligible for Student Membership. Students eligible for Junior Membership shall not be eligible for Student Membership.

**Bylaw 36**

Members promoted to a higher grade shall pay the amount of excess dues over the former rate, dating from the date of promotion, except that Student Members advanced to the grade of Junior Member during the calendar year in which they are graduated shall not be charged Junior Member dues for that year.

## Amended Requirements for Affiliate and Junior Grades

**Article III, Section 3**

Affiliate Members shall be persons who have had six years or more of practical experience in the production of timber crops or management or protection of the forest resources of forest land, and who have demonstrated their ability in practical forest administration as evidenced by employment in positions of responsibility; or persons who are graduates of institutions offering curricula in forestry not accredited by the Council of the Society of American Foresters, but containing the courses basic to professional training. Affiliate Members may be elected to Junior Membership on showing proof of eligibility.

**Bylaw 4**

Requirements for Affiliate Grade: Practical or theoretical training in forestry, or in related fields in wildland management for forest utilization, but of insufficient quality or quantity to meet the requirements of the Junior Member grade, is the basic requirement.

Class A. Graduates of institutions which offer forestry curricula, but which have not been accredited by the Council of the Society of American Foresters, shall be eligible for election to the Affiliate grade provided their instruction has included the following professional courses 1: Silviculture—3 semester units (based on ecology—3 semester units; botany, plant physiology, and dendrology—6 semester units, and soils—3 semester units); Protection (fire, insects, or disease)—3 semester units; Management—3 semester units (based on mensuration—3 semester units, surveying—3 semester units; and mathematics through trigonometry); Economics—3 semester units (based on general economics—3 semester units); and Utilization—3 semester units.

Class B. Persons who have had at least six years of practical training, or a combination of practical and theoretical training equalling at least six years, shall be eligible for election to the Affiliate grade. Each academic term of appropriate theoretical training at ranger, vocational, or professional forestry schools may be substituted for one year of practical training up to a maximum of two years. Qualifying forestry experience, which may be considered as meeting the practical training requirement, shall be obtained while the candidate is regularly engaged in growing forests, with attendant duties such as management or protection of forest areas, supervision of silvicultural requirements in logging, erosion control, or similar forestry activities; regularly engaged in related wildland activities such as range, wildlife, or recreation management; or regularly engaged in those phases of utilization having a relation to the growing of forest crops.

**Bylaw 5**

Requirements for Junior Grade: Theoretical training in the fundamental principles of professional forestry is the basic requirement.

Junior Membership is the temporary, probational, entrance grade for professionally trained foresters.

Class A. Graduates of approved curricula in institutions accredited by the Council of the Society of American Foresters shall be eligible for election to the Junior Member grade on the endorsement of three voting members. For a curriculum to be approved it must include the following professional courses: Silviculture—3 semester units (based on ecology—3 semester units; botany, plant physiology, and dendrology—6 semester units, and soils—3 semester units); Protection (fire, insects, or disease)—3 semester units; Management—3 semester units (based on mensuration—3 semester units, surveying—3 semester units, and mathematics through trigonometry); Economics—3 semester units (based on general economics—3 semester units); and Utilization—3 semester units.

Class B. Affiliate Members who have had two additional years of qualifying forestry experience since being elected to the Affiliate grade, shall be eligible for election to the Junior Member grade on the endorsement of the Section in which the member is domiciled, provided that satisfactory evidence is submitted that during their total experience they have gained a knowledge of all the basic courses which must be included as a minimum in an approved curriculum in an accredited forestry school.

## Dues Deductible

In filing U. S. income tax reports, all members may classify dues paid to the Society of American Foresters as deductible expenses.

Dues for 1951 should be paid promptly and in no case should they remain unpaid after June 30, 1951. Members whose dues are not paid by that date will receive no further issues of the JOURNAL OF FORESTRY until dues are paid.

Canadian members may pay their dues in Canadian funds. All subscriptions to the JOURNAL OF FORESTRY must be paid in U. S. funds.

## Referendum Vote 1686 to 1204

The referendum which was concluded on December 1, 1950 on the question of the administration of federal forest and range lands indicated that a majority of Society members voting preferred the recommendation offered by the majority of the members of the Commission on Organization of the Executive Branch of the Government. The vote was 1,686 to 1,204. There were approximately 6,450 members eligible to vote as of December 1.

The majority of those voting preferred "the recommendation to establish an Agricultural Resources Conservation Service in the Department of Agriculture to which would be transferred land activities of the Bureau of Land Management of the Department of the Interior" over the alternative recommendation, in the event that either is to be adopted.

The alternative recommendation, favored by 1,204 voters, was the one made by the Commission's Task Force report in the Field of Natural Resources. It recommended the establishment of "a Forest and Range Service in a Department of Natural Resources to which would be transferred the Forest Service and the research functions in forest entomology and pathology of the Department of Agriculture."

## Coming Events

### Appalachian Section

The Appalachian Section will meet on January 26 and 27 at Columbia, S. C.

### Inland Empire Section

The Inland Empire Section will meet on February 17, 1951 in Spokane, Wash. On March 24 the Section will meet in Lewiston, Idaho.

### Intermountain Section

The Intermountain Section will meet on January 29, 1951 at Ogden, Utah, with W. L. Robb in charge of the program on commercial timber. G. W. Craddock is in charge of the February 26, 1951 meeting at Ogden, Utah, to be devoted to mountain watersheds.

### New England Section

The New England Section will meet on February 22 and 23, 1951 at the Hotel Somerset in Boston, Mass.

### Southeastern Section

The Southeastern Section will meet on January 12 and 13, 1951 at Albany, Ga.

## Membership Exceeds 7,000

### Columbia River Section Leads; Southeastern Close Behind

#### 50 Percent Increase in Applications

Achieving a total membership of 7,038 on November 30, 1950, the Society netted a gain of 1,000 percent since it was founded in 1900. One thousand thirty-four new members were elected during 1950 and 54 were reinstated. Net increase for fiscal year 1950 was 410, despite the fact that 517 members delinquent at the end of *two* years (225 in 1949 and 292 in 1950) were dropped from the rolls during fiscal year 1950 as well as 161 additional members who resigned or died during fiscal year 1950. Total membership by grades on November 30, 1950 was as follows: Junior—3,315; Member—3,195; Fellow—57; Affiliate—209; Associate—198; Corresponding—52; and Honorary—12.

As shown on the accompanying Table 1, the Columbia River Section still leads the twenty others with a total of 606 members. The Southeastern Section, tied last May 31 with the Northern California Section surged ahead to narrow the margin held by the Columbia River Section. The current top ten Sections, listed in descending order of total membership are: 1. Columbia River, 2. Southeastern, 3. Northern California, 4. Appalachian, 5. Allegheny, 6. New England, 7. Gulf States, 8. Central States, 9. New York, and 10. Puget Sound.

Significant in the overall increase in Society membership was the candidacy of 1,133 applicants for Junior Membership during fiscal year 1950. This was an increase of 50 percent over the previous year. As of November 30, 1950, applications had been received from 698 or about 30 percent of all forestry graduates who received their degrees during 1950. During the comparable period in 1949, there were 343, or about 25 percent of the 1949 graduates who applied for membership. These marked increases in the number of applicants for Society membership are primarily due to a better understanding by members and nonmembers alike of the objectives, policies, and programs of the Society. This has been brought about by the effective cooperation of Section officers and committees—the membership committees in particular—and the Section representatives at forestry schools.

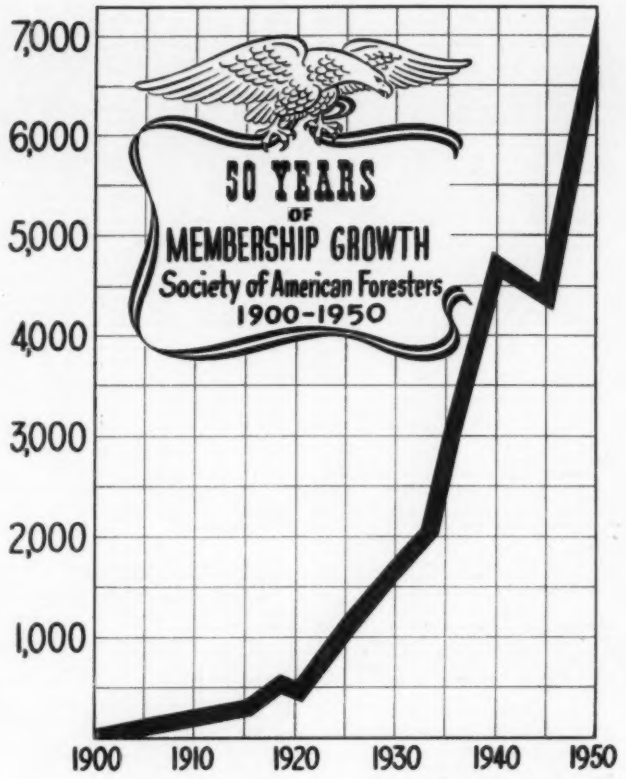


TABLE 1.—S.A.F. MEMBERSHIP BY SECTIONS, NOVEMBER 30, 1950

| Section | Rank | Total | Junior | Member | Fellow | Affiliate | Associate |
|---|---|---|---|---|---|---|---|
| 1. Section | 5 | 455 | 227 | 203 | 2 | 7 | 16 |
| 2. Appalachian | 4 | 488 | 261 | 211 | 2 | 10 | 4 |
| 3. Central Rocky Mountain | 13 | 235 | 84 | 143 | 1 | 6 | 1 |
| 4. Central States | 8 | 440 | 264 | 156 | 2 | 7 | 11 |
| 5. Columbia River | 1 | 606 | 311 | 261 | 5 | 18 | 11 |
| 6. Gulf States | 7 | 443 | 219 | 190 | 2 | 20 | 12 |
| 7. Inland Empire | 20 | 152 | 87 | 59 | 1 | 2 | 3 |
| 8. Intermountain | 17 | 180 | 74 | 106 | 0 | 0 | 0 |
| 9. Kentucky-Tennessee | 19 | 158 | 63 | 86 | 0 | 3 | 6 |
| 10. New England | 6 | 451 | 184 | 218 | 6 | 26 | 17 |
| 11. New York | 9 | 350 | 160 | 171 | 3 | 7 | 9 |
| 12. Northern California | 3 | 541 | 228 | 268 | 4 | 24 | 17 |
| 13. Northern Rocky Mountain | 16 | 180 | 94 | 83 | 1 | 0 | 2 |
| 14. Ozark | 15 | 223 | 109 | 93 | 1 | 16 | 4 |
| 15. Puget Sound | 10 | 333 | 157 | 154 | 2 | 12 | 8 |
| 16. Southeastern | 2 | 576 | 333 | 200 | 3 | 23 | 17 |
| 17. Southern California | 21 | 92 | 33 | 47 | 2 | 6 | 4 |
| 18. Southwestern | 18 | 161 | 80 | 77 | 0 | 1 | 3 |
| 19. Upper Mississippi Valley | 12 | 279 | 136 | 120 | 2 | 12 | 9 |
| 20. Washington, D. C. | 14 | 228 | 36 | 147 | 15 | 0 | 30 |
| 21. Wisconsin-Upper Michigan | 11 | 300 | 141 | 139 | 0 | 8 | 12 |
| No Section Affiliation[1] | | 103 | 33 | 63 | 3 | 1 | 2 |
| Corresponding Members | | 52 | | | | | |
| Honorary Members | | 12 | | | | | |
| Total Membership | | 7,038 | 3,315 | 3,195 | 57 | 209 | 198 |

[1]Includes members in U. S. and foreign countries who have requested that they not be designated as members of any Section.

## Foresters, Engineers Hold Joint Session

At a meeting of the American Society of Mechanical Engineers held in New York City, the A.S.M.E.'s Wood Industries Division and the Society of American Foresters jointly sponsored an evening session on November 28.

Three papers were presented:

"Special Methods for Drying Wood" by Harold N. Tombach of Altarisat, Va.

"Analytical Studies in Suppression of Wood Fires" by George J. Tauxe of the University of California at Los Angeles.

"The Field of Engineering in Forest Protection" by Gilbert I. Stewart, director of the Michigan Forest Fire Experiment Station, Michigan Department of Conservation, Roscommon, Mich.

In connection with this meeting there was a one-day conference of the joint A.S.M.E.-S.A.F. Committee on Forest Protection. Organized four years ago, this joint committee is engaged in promoting the development of equipment and machinery used in forest fire prevention and control.

A. A. Brown of the U. S. Forest Service, Washington, D. C., is chairman of the forestry group on the committee. Ira C. Funk, also of the Forest Service, is chairman of the engineer group.

## Clark-McNary Act Commemorated

Clyde S. Martin has been appointed by William A. Tinney, chairman of the Puget Sound Section, to head a committee for the purpose of erecting a plaque at Snoqualmie Falls Inn to commemorate the setting up of the Clarke-McNary Act at that place in 1923. The plaque will be of cedar in the shape of the Society emblem. The inscription will call attention to the fact that the act was the foundation for cooperative forest protection.

Other members of the committee are James Ridgeway and Howard Johnson.

The Section's action was taken at its meeting held on November 3 at Spokane, Wash., in conjunction with the Twenty-Ninth Annual Washington State Forestry Conference.

**Kentucky-Tennessee Section Meets in Nashville**

Pictured above are some of the members in attendance at the meeting of the Kentucky-Tennessee Section held in Nashville, Tenn., on November 10 and 11, 1950. Business transacted included the election of Harry Nadler, Box 31, Pineville, Ky., to the post of Vice Chairman. He will also serve as chairman of the membership committee and succeeds Maxwell MacMaster, Stanley, Inc., Pulaski, Tenn., who was advanced to Section Chairman. F. Henry Sipe, Winchester, Ky., continues as Secretary-Treasurer.

## Boy Scouts Sponsor Conservation Program

The assistance of all Society members in launching a national conservation program for Boy Scouts of America has been asked by Ted Pettit, program director. Kickoff of the program will come during Scout Anniversary Week, February 6-12, 1951 at which time the attention of 45,000 Scout Troops and 8,000 Explorer Units will be directed to local conservation problems and their remedies.

Society members are asked to work with scouts and scouters in focusing their attention on local problems of forest and land conservation and in suggesting methods by which individuals, groups, or agencies can correct poor practices in the use of natural resources.

Foresters are urged to cooperate with scouts, during Scout Week in particular, in planning store window displays, exhibits, and programs which will develop a general awareness of the value of wise land use.

Another major part of the scouts' conservation program is the establishment of wise forest management practices on camp properties owned by many of the 541 local scout councils. To make such areas "conservation laboratories" where boys and adults may learn attitudes and techniques which may be applied in their home communities is an objective of the program.

## Intermountain Section Host to State Foresters

Three Society Council members, Stanley G. Fontanna, Richard E. McArdle, and DeWitt Nelson, attended the meeting of the Intermountain Section held during the last week in September in conjunction with the annual meeting of the Association of State Foresters held at Salt Lake City, Utah. About thirty Section members and nearly all state foresters were present at a joint dinner meeting after which the movies "Watershed Fire" and "Avalanches to Order" were shown.

Plans are under way to form Chapters of the Intermountain Section in southern Idaho, Nevada, and southern Utah.

A series of winter meetings on forest recreation, livestock and wildlife range, commercial timber, and mountain watersheds are in progress to serve as background for the first annual meeting of the Section to be held in March in Logan, Utah. Its theme will be "The Economics of Conservation."

## C. S. Issues Handbook

A Section Officers' Handbook was issued in September by the Central States Section to supplement the Section Manual provided the officers of all Sections by the Society Office.

The Handbook presents a detailed outline of the duties of each officer, including suggestions on filing and transferring records.

An important feature is a part devoted to a statement of policy rulings established by the executive committee or by the membership at large.

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As of November 30, 1950, approximately 200 applications were pending for advancement from the Junior grade to the Member grade. About 800 additional Junior members are eligible to apply for promotion.

Schools from which over 35 graduates applied for membership during 1950 include: University of Georgia, Purdue University, Oregon State College, University of Florida, Michigan State College, State University of New York, and University of California.

## Columbia River Section Hears Soils Discussion

Gordon D. Marckworth served as moderator of a panel discussion on forest soils presented at the November 6, 1950 meeting of the Columbia River Section in Portland, Oreg. Participating on the panel were Ray Austin, Donald H. Baisinger, Karl Baur, Vincent Bousquet, Philip Haddock, Ted B. Plair, and Robert Tarrant. Subjects covered included forest soils problems in relation to other soils problems and to forest management, the work of various agencies in forest soils research, and forest land capability classifications.

The Forest Soils Committee for the Douglas-fir Region was formed as a result of a meeting of foresters and soil scientists at Portland, Oregon on September 15, 1948. It is sponsored by both the Columbia River and Puget Sound Sections of the Society of American Foresters and Western Forestry and Conservation Association. Its purpose is to foster research in forest soils and to serve as a central agency for forest soils information. The committee vigorously supports both basic and applied research in forest soils.

At the present time the committee is attempting to coordinate forest soils research in the Northwest by keeping records of research currently being conducted. Record sheets listing research being conducted by institutions or individuals are filed with the secretary of the committee. In this way the committee attempts to guide interested parties into lines of work not currently being investigated.

The Forest Soils Committee also attempts to assign a priority rating to forest soils problems and thus concentrate work on those problems most important at the moment. In this way it has stimulated interest in studies of the effect of forest fires on forest soils, mineral nutrition of tree species, and site classification based on soil properties. These projects are currently being worked on by committee members. The committee is attempting to interest other scientists in certain aspects of forest soils problems and thus rapidly build up a fund of information.

The committee will serve in an advisory capacity on certain forest soil problems. It has aided educational institutions to present their case for more forest soils work in forestry curriculums and the necessity for forest soils research work. The committee supported the initial attempt of the College of Forestry, University of Washington to give a field course for foresters at Pack Forest in March 1950 and was instrumental in making it a success.

The Forest Soils Committee holds quarterly meetings at which time a progress report of research in forest soils is made. The committee has no direct connection with the Forest Soils section of the Soil Science Society of America, but several members of the committee belong to this section. The Soil Science Society has exhibited a keen interest in our activities and our minutes are sent throughout the country.

Members of the Forest Soils Committee for the Douglas-Fir Region are: Karl Baur, Western Washington Experiment Station, Puyallup; Vincent Bousquet, Weyerhaeuser Timber Co., Centralia; Stanley P. Gessel, College of Forestry, University of Washington, Seattle; Leo Isaac, Pacific Northwest Forest and Range Experiment Station, Portland; Gordon D. Marckworth, College of Forestry, University of Washington, Seattle; T. B. Plair (chairman), Soil Conservation Service, Portland; George Schroeder, Crown Zellerbach Corporation, Portland; R. H. Spilsbury, Canadian Forest Service, Victoria; R. F. Tarrant, Pacific Northwest Forest and Range Experiment Station, Portland; and L. C. Wheeting, State College of Washington, Pullman.

## Spokane Meeting to Feature Watersheds

The February 17 meeting of the Inland Empire Section will devote an entire afternoon session to watershed management problems, according to an announcement in the Section's newsletter. A visit to a local industry will occupy the morning while a dinner and program are scheduled for the evening.

The Section's first fall meeting was held on the University of Idaho campus and was devoted principally to discussions regarding forest genetics. George M. Jemison discussed some of the problems and potentials of forest tree genetics. H. E. Swanson and R. I. Bingham outlined the cooperative approach being used in solving problems in connection with breeding rust-resistant western white pine and described accomplishments to date. A. E. Squillace described the work of the Northern Rocky Mountain Forest and Range Experiment Station on forest genetics problems. Dr. Risto Sarvis, who is doing forest genetics research at Helsinki, Finland outlined the problems and objectives of the program in Europe.

At the meeting the members voted to increase Section dues to enable the Section to assist in paying the expenses of official delegates to annual Society meetings.

The Section's November meeting was held in conjunction with the North Idaho Forestry Association, and the March 24 meeting will be in Lewiston, Idaho. It is to be a joint meeting with forestry students of the University of Idaho and the State College of Washington.

## Southwestern Section Studies Water Relations

About 40 members and guests attended the meeting of the Southwestern Section held at the Sierra Ancha Experimental Forest near Globe, Ariz., on September 8, 9, and 10, 1950. Watershed management was the general subject of the meeting. Herbert C. Fletcher discussed the plans, programs, and installations at Sierra Ancha, pointing out that the high water-yielding areas of Arizona and New Mexico, which comprise only 1.5 percent of the total land area, furnish at least 60 percent of the total usable water.

The effect of vegetation on water yield was discussed by Dwight Cable and Lowell Rich talked about the importance of water relationships to economy of Arizona.

A field trip was conducted to water and sediment measuring installations in the Workmen Creek area. Studies of the effect of grazing and timber harvesting on stream flow are underway.

The fall meeting of the Intermountain Section was held on December 1 and 2, 1950 at Albuquerque, N. M. The theme of the meeting was wood utilization and preservation.

## Society Featured on Air

"Fifty Years of Professional Forestry in America" was the subject of a talk presented on December 11, 1950 over radio station WGY by Floyd E. Carlson, associate professor of forest extension, State University of New York, College of Forestry. Featuring the Society's Golden Anniversary Meeting the talk was a regular program of The Farm Paper of the Air, oldest continuous agricultural broadcast in America.

## Queries and Quotes

Forestry Commission,
25, Savile Row,
London, W.I.
6th November, 1950

Mr. Charles F. Evans, President,
Society of American Foresters

Dear Mr. President,

I write in a dual capacity to congratulate the Society of American Foresters on the occasion of its Golden Anniversary Meeting.

As Chairman of the Standing Committee on British Commonwealth Forestry I have the honour, on behalf of Commonwealth Foresters, to greet you collectively and individually in admiration of the outstanding work of national importance which your Society has already accomplished in the United States, and also to express the lively hope and expectation that you will go from strength to strength.

In 1940 your Society did me the great honour of electing me an Honorary Member, and I desire accordingly to reinforce the impersonal greetings of the body of Commonwealth Foresters with my own personal felicitations.

Those of us who have practised forestry over most or all of the half century will recall how reluctant the English-speaking peoples have been to engage whole-heartedly in systematic forestry. Nevertheless, we have come a long way and I have no doubt that your Society, on reviewing progress, will find no little cause both for satisfaction and for determination to complete the job in the United States.

I am, Mr. President,
Very faithfully yours,
Robinson.
(Sir Roy L. Robinson, Chairman)

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## Candidates for Membership

Candidates for membership whose applications were received in the Society office prior to December 1, 1950 are listed below. Names, positions, addresses, and education are given.

Action regarding the eligibility of these candidates will be taken by the Council as of February 1, 1951. Comments, protests, or important information regarding the qualifications for membership of candidates listed are invited from present voting members. All such communications are kept strictly confidential, being used only by the Council in taking final action on applications. Correspondence should be received in the Society office prior to February 1, 1951.

The names of those candidates who are elected will be published in the Society Affairs department of the March 1951 JOURNAL OF FORESTRY. The names of those who signify their acceptance of election will be published in subsequent issues of the JOURNAL.

### Allegheny Section

*Junior Grade*

Smith, E. A., 44 Ewing St., Trenton, N. J.; Mich State, B.S.F., 1950.

*Affiliate Grade*

Beck, C. A., Mgr., Wood Dept., W. Va. Pulp and Paper Co., Luke, Md.

Frazier, F. O., Dist. Forester, Cons. Comm., Beckley, W. Va.

Keaton, G. E., Field Supv., U.S.D.A., Pipestem, W. Va.

### Appalachian Section

*Junior Grade*

Holland, J. C., 20 S. Third St., Wilmington, N. C.; N. C. State, B.S.F., 1950.

### Central Rocky Mountain Section

*Member Grade*

Kreutzer, W. R., 426 Peterson St., Ft. Collins, Colo. Reinstatement.

### Central States Section

*Junior Grade*

Anderson, L. E., 708 B. Chestnut Rd., E. Lansing, Mich.; Mich. State, B.S.F., 1950.

Basel, C. O., 415-B Willow Lane, E. Lansing, Mich.; Mich. State, B.S.A., 1950.

Johnson, D. L., Ossineke, Mich.; Mich. State, B.S.A., 1950.

Kageorge, M. W., 631 Deerfield Ave., Highland Park, Ill.; Iowa State, B.S.F., 1950.

Young, G. E., 917 Seymour Ave., Lansing, Mich.; Mich. State B.S.F., 1950.

*Corresponding Grade*

Badran, O. A., Grad. Student, Univ. of Mich., Ann Arbor, Mich.; Univ. of Calif., B.S.F., 1949.

### Columbia River Section

*Junior Grade*

Black, E. D., 425 E. Cass St., Roseburg, Ore.; Mich. State, B.S.F., 1950.

Dixon, H. S., Forester, Oregon State Board of Forestry, Salem, Oreg.; State College of Wash., B.S.A., 1934. Reinstatement.

Lockett, T., Forestry Aide, Bur. of Land Mgmt., Roseburg, Oreg.; Univ. of Wash., B.S.F., 1948.

Schmidt, F. F., Engr. Asst., Associated Plywood Mills Inc., Glide, Oreg.; Mich. State, B.S.F., 1950.

Warman, D. A., Fire Control Aide, U.S.F.S., Glide, Oreg.; Univ. of Minn., B.S.F., 1950.

*Member Grade*

Hult, G. W., Consulting Forester, Corvallis, Oreg.; Oregon State, B.S.F., 1916. Reinstatement.

### Gulf States Section

*Junior Grade*

Hoag, C. A., Jr., 5737 Penrose, Dallas, Tex.; Mich. State, B.S.F., 1950.

Jameson, D. E., Forester, Miss. Products Inc., Jackson, Miss.; N. Y. State, B.S.F., 1942.

LeBlanc, W. J., Box 35, Penchatoula, La.; La. State, B.S.F., 1950.

Miller, C. H., Head Wood Scaler, International Paper Co., Natchez, Miss.; La. State, B.S.F., 1950.

Nelson, J. A., Forest Tech., International Paper Co., Zwolle, La.; Colo. A & M., B.S.F., 1950.

Roye, A. O., Tie and Tbr. Inspt., Texas and New Orleans R. R., Baton Rouge, La.; La. State, B.S.F., 1950.

*Member Grade*

Buescher, P. P., Mill Supt., Harriston Hardwood Co., Harriston, Miss.; La. State, B.S.F., 1941. (Junior 1946).

Dedeaux, R. J., Consulting Forester, Perkinston, Miss.; La. State, B.S.F., 1941; Duke, M.F., 1948. (Junior 1947).

Fender, D. E., Dist. Forester Engr., International Paper Co., Nacogdoches, Tex.; Univ. of Ga., B.S.F., 1942. (Junior 1946).

Jones, M. S., Jr., Forester, Woodard-Walker Lbr. Co., Taylor, La.; La. State, B.S.F., 1938. (Junior 1947).

McKnight, J. S., Forester, U.S.F.S., Stoneville, Miss.; Colo. A & M., B.S.F., 1941; Yale, M.F., 1942. (Junior 1947).

Ritchie, J. I., Forest Supt., La. Forestry Comm., Woodworth, La.; La. State, B.S.F., 1942. (Junior 1946).

Robertson, C. W., Consulting Forester, International Paper Co., Natchitoches, La.; La. State, B.S.F., 1941. (Junior 1946).

Weatherly, J. E., Jr., Forest Mgmt., Director, Miss. Forestry Comm., Jackson, Miss.; La. State, B.S.F., 1941. (Junior 1947).

### Inland Empire Section

*Junior Grade*

Darrach, A. G., Jr., Headquarters, Idaho; Pa. State, B.S.F., 1950.

Hunter, D. B., Headquarters, Idaho; Pa. State, B.S.F., 1949.

McDonald, T. Fire Control Aide, U.S.F.S., Coeur D'Alene, Idaho; Mont. State, B.S.F., 1950.

Ringold, G. B., Tbr. Marker, Potlatch Forests Inc., Lewiston, Idaho; Univ. of Minn., B.S.F., 1950.

### Kentucky-Tennessee Section

*Junior Grade*

Dickhaus, R. V., 1118 Cecelia Ave., Park Hills, Ky.; Mich. State, B.S.F., 1950.

### New England Section

*Junior Grade*

Lindahl, R. R., 50 Arch St., New Haven, Conn.; Pa. State, B.S.F., 1950.

Perkins, P. C., Jr., Engr., Eastern Corp., S. Brewer, Me.; Univ. of Me., B.S.F., 1950.

Reiske, R. F., Soil Scientist, S.C.S., Worcester, Mass.; N. Y. State, B.S.F., 1949.

*Member Grade*

Abbott, H. G., Forester, Chadbourne Lbr. Co., Bethel, Me.; Univ. of Me., B.S.F., 1943. (Junior 1945).

Bush, H. H., Dist. Rgr., U.S.F.S., Middlebury, Vt.; Univ. of Idaho, B.S.F., 1930. (Junior 1946).

Logan, B. A., Asst. General Supt. of Woodlands, Howard Smith Paper Mills, Ltd., Montreal, Can.; Univ. of N. B., B.S.C.F., 1933. (Junior 1949).

Pendleton, R. E., Asst. Supv., Forestry Dist., Island Falls, Me.; Univ. of Me., B.S.F., 1933. (Junior 1945).

Rand, C. W., Forester, Brown Co., Berlin, N. H.; Univ. of Me., B.S.F., 1932. (Junior 36R49).

Smith, D. M., Instructor, Yale Univ., School of Forestry, New Haven, Conn.; R. I. State College, B.S., 1941; Yale, M.F., 1946; Ph.D., 1950. (Junior 1946).

*Associate Grade*

Gruen, E. D., Asst. Prof., Finance and Statistics, Dartmouth College, Hanover, N. H.; Dartmouth College, A.B., 1931.

**New York Section**

*Junior Grade*

Kingston, J. T., Dept. of Forest Botany and Path., State Univ. of N. Y., Syracuse, N. Y.; Univ. of N. B., B.S., (Forestry), 1943; Yale, M.F., 1950.

*Member Grade*

Benson, R. W., County Forester, Onondaga County Park Board, Syracuse, N. Y.; N. Y. State, B.S.F., 1939. (Junior 1946).

Coutant, S. E., Forester, N. Y. State Cons. Dept., Poughkeepsie, N. Y.; N. Y. State, B.S.F., 1939. (Junior 1946).

Farrell, J. H., Forest Appraiser, N. Y. State Board of Equalization and Assessment, Saranac Lake, N. Y.; N. Y. State, B.S.F., 1942; M.F., 1948. (Junior 1947).

Merritt, C., Instructor, N. Y. State Rgr. School, Wanakena, N. Y.; Univ. of Mich., B.S.F., 1943; M.F., 1948. (Junior 1945).

Mullin, R. E., Nursery Supt., Ontario Dept. of Lands and Forests, Toronto, Can.; Univ. of Toronto, B.S.F., 1942; Univ. of Mich., M.F., 1946. (Junior 1946).

Phillips, J. E., Forester, W. J. Cower Inc., Berlin, N. Y.; Purdue Univ., B.S.F., 1937; N. Y. State, M.F., 1940. (Junior 1946).

Stock, J. W., Forester, Conifer Lbr. Mills, Conifer, N. Y.; N. Y. State, B.S.F., 1937. (Junior 1945).

Williams, R. B., Asst. Prof. Forest Recreation, N. Y. State College, Syracuse, N. Y.; N. Y. State, B.S.F., 1938; M.S., 1942. (Junior 1948).

Zabel, R. A., Asst. Prof., N. Y. State College, Syracuse, N. Y.; Univ. of Minn., B.S.F., 1938; N. Y. State, M.S., 1942; Ph.D., 1947. (Junior 1949).

**Northern California Section**

*Junior Grade*

Callaham, R. Z., Biological Aid, Bur. of Ent., and Plant Quar., Berkeley, Calif.; Univ. of Calif., B.S.F., 1949.

Furniss, M. M., Supv. Control Aide, Bur. of Ent., and Plant Quar., Berkeley, Calif.; Univ. of Calif., B.S.F., 1950.

Jacobson, W. T., Asst. Deputy State Forester, Div. of Forestry, Fresno, Calif.; Univ. of Calif., B.S.F., 1935.

Schori, M. O., Forest Rgr., Div. of Forestry, Placer County, Calif.; Univ. of Calif., B.S.F., 1946.

Scott, E. L., Box 514, Blue Lake Calif.; Univ. of Calif., B.S.F., 1950.

Spurgeon, S. E., Tbr. Mgmt. Asst., U.S.F.S., Quincy, Calif.; Oregon State, B.S.F., 1950.

Wood, H. J., 247 14th St., San Bernardino, Calif.; Univ. of Calif., B.S.F., 1950.

*Member Grade*

Kaufner, H. B., Forest Tech., Calif. State Div. of Forestry, Santa Rosa, Calif.; Univ. of Calif., B.S.F., 1938. (Junior 39R48).

Schubert, G. H., Forester, Calif. Forest and Range Exp. Sta., Berkeley, Calif.; W. Va. Univ. B.S.F., 1942; Univ. of Calif., M.S., 1949. (Junior 1947).

Stevens, C. W., Forester, Calif. Forest and Range Exp. Sta., Berkeley, Calif.; Univ. of Calif., B.S.F., 1946. (Junior 1947).

**Northern Rocky Mountain Section**

*Member Grade*

Fulton, L. R., Forester, U.S.F.S., Libby, Mont.; Univ. of Idaho, B.S.F., 1941. (Junior 1944).

**Puget Sound Section**

*Junior Grade*

Lausch, B. A., Logging, Corning Logging Co., Deming, Wash.; Univ. of Wash., B.S.F., 1949.

Mounteer, R. W., Forestry Aid, Bur. of Land Mgmt., Anchorage, Alaska; Mich. State, B.S.F., 1949.

Stevens, M. J., Forester, Taholah Indian Agency, Hoquiam, Wash.; Utah State, B.S.F., 1950.

*Member Grade*

Buckland, D. C., Research Officer, Univ. of B. C., Vancouver, B. C.; Univ. of B. C., B. A., 1941; Yale, M.F., 1943; Ph.D., 1945. (Junior 1946).

**Southeastern Section**

*Junior Grade*

Craft, E. J., Jr., Forester, U.S.F.S., Ocala, Fla.; Univ. of Fla., M.S.F., 1948.

Ogletree, W. T., Asst. Forester, Wm. Sizemore and Co., Tallassee, Ala.; A.P.I., B.S., (Forestry), 1949.

Weeks, R. H., Jr., Proj. Forester, Ala. Dept. of Cons., Ozark, Ala.; A.P.I., B.S., (Forestry), 1949.

**Southern California Section**

*Junior Grade*

Ebnet, J. M., Crew Boss, U.S.F.S., Del Rosa, Calif.; Univ. of Calif., B.S.F., 1950.

Glunt, T. E. Forestry Aid, U.S.F.S., Mt. Hebron, Calif.; N. C. State, B.S.F., 1949.

**Southwestern Section**

*Junior Grade*

Gossard, D. C., Forestry Aid, U.S.F.S., Pinedale, Ariz.; Iowa State, B.S.F., 1949.

Lamb, A. J., Forester, U.S.F.S., Flagstaff, Ariz.; Colo. A & M., B.S.F., 1950.

Olson, C. H., Forester, U.S.F.S., Albuquerque, N. Mex.; Univ. of Minn., B.S.F., 1947.

Reynolds, R., Forester, Sitgreaves National Forest, Holbrook, Ariz.; Mich. State, B.S.F., 1936.

**Upper Mississippi Valley Section**

*Junior Grade*

Stephens, V., Camp Supt., U.S.F.S., Kremmling, Colo.; Univ. of Mont., B.S.F., 1934. Reinstatement.

*Affiliate Grade*

Gorence, J., Asst. Supv., Minn. Cons. Dept., Hibbing, Minn.

Leerssen, O. F., Forest Rgr., Minn. Forest Service, St. Paul, Minn.

Tarbell, R. C., Forest Rgr., Div. of Forestry, Moose Lake, Minn.

**Washington Section**

*Member Grade*

Flick, F. J., Special Bibliographer, U.S.D.A., Washington, D. C.; Iowa State, B.S.F., 1939; N. Y. State, B.S., (Library Science), 1943. (Junior 1947).

Harrison, J. D. B., Chief, Economics Section, F.A.O., Washington, D. C.; Univ. of N. B., B.S.F., 1924. (Junior 1948).

Tribbett, V. A., Chief, Branch Forest Protection, Bur. of Land Mgmt., Washington, D. C.; Iowa State B.S.F., 1936. (Junior 36R50).

**Wisconsin-Upper Michigan Section**

*Junior Grade*

Berndt, H. E., Forester, Wis. Cons. Dept., Tomahawk, Wis.; Univ. of Mich., B.S.F., 1950.

*Member Grade*

Argetsinger, L. M., Staff Forester, Kimberly-Clark Corp., Neenah, Wis.; Univ. of Mich., B.S.F., 1941; M.F., 1941. (Junior 1947).

Bourdo, E. A., Jr., Instructor, Forestry Dept., Mich. College of Mining and Tech., Houghton, Mich.; Mich. College of Mining and Tech., B.S., (Forestry), 1943; Univ. of Mich., M.A., 1951. (Junior 1947).

Dosen, R. C., Forester, Nekoosa Edwards Paper Co., Port Edwards, Wis.; Univ. of Minn., B.S.F., 1939. (Junior 1947).

George, L. E., Staff Forester, Kimberly-Clark Corp., Neenah, Wis.; Pa. State, B.S.F., 1943. (Junior 1945).

Martin, J. V, Supt., Rhinelander Paper Co., Rhinelander, Wis.; N. Y. State, B.S.F., 1930. (Junior 1946).

Martz, R. O., Forest Products Tech., Forest Products Lab., Madison, Wis.; Ottawa Univ., B.S., (Biology) 1924; Iowa State, M.S., 1929. (Asso. 37, Junior 46).

Swanson, A. L., Scaler, Kimberly-Clark Corp., Neenah, Wis.; Mich. State, B.S.F., 1940. (Junior 1947).

Upton, N. W., Forester, Wisconsin Realty Co., Park Falls, Wis.; Univ. of Minn., B.S.F., 1924. (Junior 1950).

Von Dahlen, M., Forester, Wis. Cons. Dept., Madison, Wis.; Univ. of Bonn and Kiel, Germany, B.S., (Forestry and Agric.), 1923. (Junior 1947).

Welsh, S. W., Chief, Forest Inventory, Wis. Cons. Dept., Madison, Wis.; Univ. of Wisconsin, B.S.F., 1934; M.F., 1936. (Junior 1946).

**Foreign**

*Corresponding Member*

Moilanen, Tuomo, Toolonk 14A, Helsinki, Finland; N. Y. State, M. S., 1950. Committee on International Relations.

## Candidates Elected

The following persons were elected to the indicated grades of membership by the Council on December 1, 1950.

*Junior Grade*

Armstrong, R. C.
Arnold, B. L.
Aultfather, W. A.
Aycock, R. J.
Beal, R. L.
Beall, C. R., Jr.
Brabham, W. C.
Bray, I. L.
Brownworth, F. S., Jr.
Collicott, L. V.
Crews, A. C.
Crooke, D. E.
Cummings, J. A.
Davey, C. B.
Dickinson, J. S.
Eadie, F. H.
Ellington, J. E.
Forrest, J. S.
Fox, J. A.
Gehr, C. R.
Goebel, G. E.
Greene, J. T.
Groom, D. G.
Harper, W. C.
Harrell, H. P.
Harrison, S.
Henson, J. A.
Hock, H. H.
Jenkins, G. G.
Lane, H. M.
Lewis, R. F.
Lisenby, W. E.
Manning, R. W.
Martinez, E. J.
Martz, T. B.
Massingille, A. L.
McClurkin, D. C.
Meister, K. R.
McNamara, E. F.
Mixon, J. E. (re.)
Moody, J. R., Jr.
Morris, W. E.
Netterville, J. W., Jr.
Pepper, A. A., Jr.
Powell, H. T.
Prince, W. L.
Ratliff, W. S.
Reed, J. O.
Roberts, S. P.
Safley, J. W.
Sanford, W. M.
Schneider, J. E.
Seller, W. J.
Sorgenfrei, S. J.
Spangler, J. E.
Stewart, D. L.
Sullivan, W. C.
Sykes, J. E.
Ter Bush, F. A.
Thompson, R. M.
Tinker, F. E.
Turpin, D. H.
Villesvik, J. U.
White, P. H.
Wilkinson, J. M., Jr.
Williams, F. E.
Zink, H. E.

*Associate Grade*

DeWeese, T. A.
Hanna, R. T.
Kuntz, J. E.

*Member Grade*

Beckert, W. M.
Glesne, N. G.
Sample, L. A. (re.)
Siemert, H. F.
Young, M. M.

## New Members and Advancements

The new members and members who have been advanced in grade who are listed below are eligible for participation in the activities of the Society of American Foresters, including the meetings and projects of Sections, Chapters, Divisions, and Committees. They have submitted their applications for membership, properly endorsed, and have been declared eligible by the Council. By accepting election, these members have indicated their desire to assist the Society in the fulfillment of its objectives.

**Allegheny Section**

*Junior Grade*

Drury, P. R., 800 Thomas St., Stroudsburg, Pa.
Houghton, H. A., Box 670, Princeton, N. J.
Krayer, W. J., 1512 Shenk Ave., Erie, Pa.
Lavin, J. J., 223 S. 57th St., Phila., Pa.
Phelps, W. R., Monkton, Md.
Rondum, S. B., 31 Summer St., Bradford, Pa.
Slade, R. S., 62 W. Center St., Woodbury, N. J.
Sterrett, J. P., County Forester, Petersburg, W. Va.
Youngblood, E. F., 1026 Ridge St., Scranton, Pa.

**Appalachian Section**

*Junior Grade*

Curle, L. D., 8 Ferndell Lane, Raleigh, N. C.
Edwards, A. C., 2005 Jefferson Park, Charlottesville, Va.
Ellis, C. W., Estill, S. C.
Funderburke, K. P., Jr., 8 Hampton Court, Walterboro, S. C.
Geddes, R. B., Box 960, Richmond, Va.
Hamilton, M. E., 114 Virginia St., Farmville, Va.
Larrabee, D. R., Box 4263, Durham, N. C.
Malsberger, H. J., Jr., 121 Broad St., Georgetown, S. C.
Moon, E. C., 101 S. Laurel Ave., Charlotte, N. C.
Mulkey, M. A., 229 E. Park Ave., Charlotte, N. C.
Pierce, W. L., 409 E. Second St., Farmville, Va.
Shavis, J. M., 207 14th St., N.W. Charlottesville, Va.
Stuckey, J. H., Box 65, Kingstree, S. C.

*Affiliate Grade*

Smith, F. W., Box 1602, Wilmington, N. C.

**Central Rocky Mountain Section**

*Junior Grade*

Mattoon, J. A., U.S.F.S., Boulder, Colo.
Mitchell, W. J., Box 2, Foxpark, Wyo.
Nobles, R. W., 1043 Cherokee, Denver, Colo.

**Central States Section**

*Junior Grade*

Bottke, E. A., Pinckney, Rec. Area., Pinckney, Mich.
Fagan, J. H., 832-D Chestnut Rd., E. Lansing, Mich.
Faulkner, C. R., 430 N. Grand St., W. Lafayette, Ind.
Gillie, R. E., 337 W. Butler, Ft. Wayne, Ind.
Harrison, R. P., Jr., 1408 Hanover Ct., Willow Run, Mich.
Hays, H. E., 603 N. 6th St., Vincennes, Ind.
Sanford, C. A., 208 W. Elbert, Indianapolis, Ind.
Somers, W. A., Washington, Mich.
Stekiel, R. J., 524 Packard St., Ann Arbor, Mich.
Tkach, J. G., 2625 Cooper St., Youngstown, Ohio
Veverka, R., 3683 W. Park Rd., Cleveland, Ohio
Walker, R. S., 12 W. Warren St., Calumet City, Ill.

**Columbia River Section**

*Junior Grade*

Ehm, R. E., Box 385, Sutherlin, Oreg.
Higinbotham, D. D., 1713 Harrison Drive, Astoria, Oreg.
Martin, J., 630 25th Ave., Longview, Wash.
Proud, O. R., 804 Lord St., Kelso, Wash.
Richardson, J. H., 704 North Cottage, Salem, Oreg.
Rowley, M. L., Gen. Dev., Winston, Oreg.
Warner, P. W., 558 N. Main St., Prineville, Oreg.

*Member Grade*

Korte, K. H., 3033 Oahu Ave., Honolulu, Hawaii
Turay, M. C., Box 96, Cottage Grove, Oreg.

**Gulf States Section**

*Junior Grade*

Campbell, E. R., Lake, Miss.
Cann, J. J., Box 96, Pontotoc, Miss.
Carter, R. T., Greensburg, La.
Corn, E. F., Gen. Dev., Bogalusa, La.
Golden, E. A., 1911 Ave. M., Huntsville, Tex.
Strong, O. B., 514 W. Chickasaw St., Brookhaven, Miss.
Taylor, N. W., 6 Farmers Row, Groton, Mass.
Thigpen, D., Rt. #2, Franklinton, La.
Westmoreland, L. R., Box 502, Jena, La.

*Affiliate Grade*

Guice, W., 714 N. President St., Jackson, Miss.
Stuart, J. N., Box 128, Morton, Miss.

**Inland Empire Section**

*Junior Grade*

McDonald, C. A., 1069 1st St., Coeur d'Alene, Idaho
Miles, W. F., Bovill, Idaho
Nelson, R. L., 128 16th St., Lewiston, Idaho

**Intermountain Section**

*Junior Grade*

Gurnsey, V. L., Boise Payette Lbr. Co., Boise, Idaho

**Kentucky-Tennessee Section**

*Junior Grade*

Batson, J. O., Sewanee, Tenn.
Disney, W. L., 825 4th St., Corbin, Ky.

**New England Section**

*Junior Grade*

Buschena, A. J., Jr., Station A., Gorham, N. H.
Carome, C. J., 187 Seymour Ave., Derby, Conn.
Lester, E. J., 56 Main St., South Paris, Me.
Thornton, P. L., 64 High St., Claremont, N. H.

**New York Section**

*Junior Grade*

Dorn, D. E., R.F.D. #1, Castleton, N. Y.
Stickney, R. A., 17 Elm St., Saranac Lake, N. Y.

**Northern California Section**

*Junior Grade*

Carr, S. B., Box 434, Fort Bragg, Calif.
Chatten, L. R., 5820 64th St., Sacramento, Calif.

Doner, M. H., 5537 Telegraph Ave., Oakland, Calif.
Durbin, J. H., Box 768, Westwood, Calif.
Ingraham, R. H., 2636 Haste St., Berkeley, Calif.
Jackson, W. L., 438 Roop St., Susanville, Calif.
Jeffers, G., U.S.F.S., North Fork, Calif.
Koll, E. J., 2931 Magnolia St., Berkeley, Calif.
Langley, P. G., Gen. Dev., Chester, Calif.
McCloskey, L. F., Fibreboard Products Inc., Antioch, Calif.
Nicklos, J. F., Forest House, Forest Hill, Calif.
Prescott, J. A., Boonville, Calif.
Taylor, G. W., 504 Silva Ave., Eureka, Calif.
Trestrail, R. W., U.S.F.S., Quincy, Calif.

**Northern Rocky Mountain Section**

*Junior Grade*

Armstrong, L. W., 444 1st Ave., E., Kalispell, Mont.
Beltzer, C. E., Jr., Washoe, Mont.
Hegland, A. W., Rt. #3, Missoula, Mont.

**Ozark Section**

*Junior Grade*

Menke, C. H., Forest Managers, Monticello, Ark.
Wehking, E. F., 309 S. 5th St., Columbia, Mo.
Wylie, J. E., Box 157, Warrenton, Mo.

*Member Grade*

Cooper, R. E., Dardanelle, Arkansas

**Puget Sound Section**

*Junior Grade*

Bohlig, R. Q., Snoqualmie Falls, Wash.
McCormack, H. E., U.S.F.S., Glacier, Wash.

*Member Grade*

Cleator, F. W., 2406 Buker St., Olympia, Wash.
Lauterbach, P. G., Box 420, Centralia, Wash.
Lloyd, W. J., Box 1324 Place, Edmonds, Wash.

**Southeastern Section**

*Junior Grade*

Allen, H. P., Box 122, Camilla, Ga.
Comer, F. G., Jr., 3012 Dodd St., Rt. #5, Gadsden, Ala.
Davis, S. A., Rt. #3, Gainesville, Fla.
Ellington, H. G., 410 N. Louisville St., Sylacauga, Ala.
Farr, M. W., Ga. Forestry Comm., Macon, Ga.
Findley, J. E., c/o Coosa River Newsprint, Coosa Pines, Ala.
Gibson, K. B., 210 Rogers Ave., Macon, Ga.
Hoffman, G. C., 1409 N. Duval St., Tallahassee, Fla.
Lewis, W. I., Mill Pond Plantation, Thomasville, Ga.
McCullers, A. G., Jr., Rt. #1, Gainesville, Fla.
Orr, J. V., Box 267, Butler, Ga.
Post, D. M., Umatilla, Fla.
Thrash, R. D., Tutt Lbr. Co., Inc., Nanafalia, Ala.

*Affiliate Grade*

Earnest, J. T., Int. Paper Co., Albany, Ga.

**Southern California Section**

*Junior Grade*

MacCoombes, G., 485 Walnut St., Pomona, Calif.

**Southwestern Section**

*Junior Grade*

Perry, E. L., U.S.F.S., Albuquerque, N. Mex.
Summerly, J. J., Gen. Dev., Whiteriver, Ariz.

**Upper Mississippi Valley Section**

*Junior Grade*

Carson, B. F., Rt. #3, Mora, Minn.
Dunnell, C. W., 619 19th St., Brainerd, Minn.
Gabrielson, O. U., Jewell, Iowa
Ingram, D. O., Grand Marais, Minn.
Lukkarila, R. W., 8 First St., S. W., Chisholm, Minn.

**Wisconsin-Upper Michigan Section**

*Junior Grade*

Anderson, A. M., 302 N. 21st St., LaCrosse, Wis.
Baldwin, A. G., 23 S. 4th St., Black River Falls, Wis.
Bell, R. J., 220 3rd St., S., Wisconsin Rapids, Wis.
Jensen, E. P., Griffith State Nursery, Wisconsin Rapids, Wis.
Lemke, M. M., 8th AAA Bn., Sault Ste Marie, Mich.
Moffett, P. S., Rgr. Sta., Ontonagon, Mich.
Steinbrenner, E. C., Univ. of Wisconsin, Madison, Wis.
Tobin, W. T., Seney, Mich.

**Foreign**

*Corresponding Grade*

Wijkstrom, Stig, Swedish Match Co., Jonkoping, Sweden

# Consulting Foresters

*Approved for Listing on January 1, 1951 by the*

## SOCIETY OF AMERICAN FORESTERS

The following List of Consulting Foresters is published by the Society of American Foresters for the information of prospective clients.

Individuals listed are members of the Society of American Foresters and as such are believed qualified and competent to perform the technical services specified. However, the Society cannot assume responsibility for the actions of individuals or firms listed.

Permission to publish or reproduce this list in whole or in part, but without unauthorized additions, is hereby granted. Revised lists will be issued annually.

### Code of Fields of Specialization

1. Arboriculture and tree preservation.
2. Cost and economic studies of forest operations.
3. Forest and wood utilization.
4. Forest management and silvicultural practice.
5. Forest protection from disease.
6. Forest protection from fire.
7. Forest protection from insects.
8. Forest taxation.
9. Game and wildlife management.
10. Logging engineering.
11. Market studies and trade promotion (forest products).
12. Naval stores operations.
13. Pulpwood operations.
14. Range management.
15. Surveying and mapping.
16. Timber valuation and appraisal.
17. Timber volume and quality estimates.
18. Tree planting and reforestation; reproduction studies.
19. Wood preservation.
20. Wood seasoning.
21. Wood technology.

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**Ace Engineers and Surveyors**, 8520 30th Avenue, N.E., Seattle 5, Washington.
Consultant: Robert W. Jones.
Territory: Washington.
Specialization: 10, 15, 17.

**Thos. W. Alexander**, Consulting Forester, Waynesville, North Carolina.
Territory: South, Central States, and Appalachians.
Specialization: 2, 4, 11, 16, 17.

**S. Gayley Atkinson**, Consulting Forester, Huntington Road, Huntington Valley, Pennsylvania.
Territory: Pennsylvania.
Specialization: 1, 18.

**Henry L. Bango**, Consulting Forester, P. O. Box 4072, Shreveport, Louisiana.
Territory: Northern Louisiana.
Specialization: 3, 4, 5, 16, 17, 18. Also purchase and sale of timbered properties.

**George Banzhaf & Company**, 662 North Water St., Milwaukee 2, Wisconsin.
Territory: Lake States.
Specialization: 2, 4, 13, 15, 16, 17.

**Belanger and Bourget**, Land Surveyors and Forest Engineers, 86 Cote de la Montagne, Quebec, Canada.
Consultant: M.-Albert Bourget.
Territory: Canada, especially Quebec.
Specialization: 2, 3, 4, 10, 11, 13, 15, 16, 17, 19, 20, 21. Also boundary lines.

**Bigley and Feiss, Foresters, Inc.**, 283 Miner Building, Eugene, Oregon.
Consultants: Sherman Feiss, John Venator.
Territory: Washington, Oregon, California.
Specialization: 2, 3, 4, 6, 15, 16. Also sustained yield plans, supervision of contract logging, and timberland sales.

**Jack C. Blakeney**, Consulting Forester, % Hickory Handle Co., Inc., P. O. Box 253, Batesburg, South Carolina.
Territory: South Carolina.
Specialization: 3, 4, 6, 7, 11, 13, 16, 17, 18.

**Lewis M. Boice**, Consulting Forester, Orangeburg, South Carolina.
Territory: Within 100 miles of Orangeburg.
Specialiation: 4, 15, 16, 17.

**Gordon Bowker**, Consulting Forester, % J. W. Lyle, Richburg, South Carolina.
Territory: Eastern U. S.
Specialization: 4, 9, 15, 16, 17, 20. Also advice on plantation management.

**Allen W. Bratton**, Consulting Forester, Shelterwood, Cooperstown, New York.
Territory: Northeast.
Specialization: 4, 5, 6, 7, 8, 11, 15, 16, 17, 18.

**Charles H. Bunting**, Timber Cruiser, Room 717, 300 Montgomery Street, San Francisco, California.
Territory: California.
Specialization: 2, 10, 15, 16, 17.

**California Foresteering**, 429 Main Street, Placerville, California.
Consultant: Wm. B. Berry.
Territory: California pine region.
Specialization: 2, 3, 4, 10, 16. New solutions to the old problems of logging, milling, and timber management.

**N. D. Canterbury**, Consulting Forester, 4214 St.Emanuel Street, Apt. 3, Houston 4, Texas.
Territory: Texas and southeastern U. S.

**Connwood, Inc.**, 839 Chapel Street, P. O. Box 1577, New Haven 6, Connecticut.
Consultants: Ralph C. Hawley, Michael M. Pochan, Jr.
Territory: Connecticut and adjacent areas.
Specialization: 3, 4, 10, 11, 13, 15, 17, 18, 19, 21.

**Grover M. Conzet**, 220 Garden Lane, Decatur, Georgia.
Territory: Eastern U. S.
Specialization: 3, 6, 9, 11. Also training of fire crews, training in formanship and sawmill operation, and general training methods.

**David B. Cook**, Consulting Forester, 14 Nolan Road, Albany 5, New York.
Territory: Eastern New York.
Specialization: 4, 8, 9, 13, 16, 18.

**Philip T. Coolidge**, Consulting Forester, 31 Central Street, Bangor, Maine.
Territory: Not limited.
Specialization: 2, 4, 8, 10, 13, 15, 16, 17, 18. Also farm appraisal.

**William T. Cox**, Consulting Forester—Biologist, 2186 Doswell Avenue, St. Paul 8, Minnesota.
Territory: General.
Specialization: 4, 9, 16. Also appraisals of tropical forest properties; development of furbearers and other wildlife; selection of new locations for woodworking plants.

**James W. Craig**, Consulting Forester, Leavell Woods Station, Jackson, Mississippi.
Consultants: James W. Craig, Keith E. Steckel.
Territory: Mississippi and the South.
Specialization: 3, 4, 6, 13, 15, 16, 17, 18. Also complete line of forestry supplies.

**Keith Cranston & Associates**, Leland, Mississippi.
Territory: Mississippi delta and hardwood bottomlands, and Gulf States.
Specialization: 2, 3, 4, 10, 11, 13, 16, 17, Acting as forester-in-charge for operating mill firms and on privately owned hardwood and pine tracts.

**John M. Crowl**, Consulting Forester, Route 5, Cadiz, Ohio.
Territory: Not Limited.
Specialization: 1, 2, 3, 5, 6.

**Randle J. Dedeaux**, Consulting Forester, P. O. Box 52, Perkingston, Mississippi.
Territory: Southern Mississippi; longleaf and slash pine types.
Specialization: 4, 13, 15, 17. Also growth studies, timber marking and marketing, and agent for absentee timberland owners.

**W. T. Doherty**, Consulting Forester, 421 N. Morningside, Albuquerque, New Mexico.
Territory: Arizona, New Mexico.
Specialization: 4, 15, 16, 17. Also land classification.

**William A. Eastman**, Jr., Consulting Forester, William A. Eastman & Co., Inc., 410 Green Building, Seattle 1, Washington.
Territory: Pacific Northwest.
Specialization: 10, 15, 16, 17, 18. Also preparation and administration of timber sales, land appraisal, timberland brokerage, and timberland management.

**Nils B. Eckbo**, Industrial Forestry Consultant, 26 Rhodes Avenue, Parktown. Johannesburg, South Africa.
Territory: Southern Africa.
Specialization: Industrial forestry.

**John E. Evans**, Consulting Forester, 57 Prospect Street, Lancaster, New Hampshire.
Territory: Northeast.
Specialization: 4, 6, 15, 16, 17, 18.

**George M. Fisher**, Consultant Forester and Landscape Engineer, 1701 Louisiana Street, Lawrence, Kansas.
Territory: Kansas, Missouri, Iowa, Nebraska.
Specialization: 1, 4, 5, 7, 11, 18. Also farm forestry; city forestry and shade tree problems; plant materials and planting lists; landscape design, construction, and maintenance; forest parks and recreational planning.

**Reginald D. Forbes**, Consulting Forester, R.F.D. 1, Ambler, Penasylvania.
Territory: Eastern U. S.
Specialization: 4, 6, 17, 18. Also forest resource surveys of timber available to manufacturing plants in specified territories.

**Forest Managers, Inc.**, Consulting Foresters, 211 Beach Avenue, Atlantic Beach, Florida and 1826 N. Orchard Street, Santa Rosa, California.
Consultants: S. J. Hall, D. Eric Bradshaw, Nelson B. Blocker.
Territory: South and Southeast, including Appalachians; also redwood region.
Specialization: 3, 4, 6, 8, 12, 13, 15, 16, 17, 18. Also pulpwood resource investigations, timberland management, timberland brokerage, insurance company representative for loans on forest properties.

**R. C. Fraunberger**, Forest Products Business Consultant, 418 Park View Drive, Wynnewood, Pennsylvania.
Specialization: 2, 8, 11, especially in hardwoods, domestic and foreign.

**Emanuel Fritz**, Consulting Forester, 102 The Uplands, Berkeley 5, California.
Territory: California; pine and redwood.
Specialization: 2, 3, 4, 6, 10, 11, 16, 17, 18, 19, 20, 21. Also consultant on state forest and park management and policy.

**LeRoy Frontz**, Consulting Forester, Allenwood, Pennsylvania.
Territory: Eastern U. S.
Specialization: 3, 4, 5, 6, 7, 9, 16, 17, 18. Also landscaping, forest and ornamental nurseries, farm forestry, forest parks and recreation, landuse planning, soil conservation, farm evaluation and appraisal.

**John D. Gilmour**, Consulting Forester, 5823 McLynn Avenue, Montreal, Quebec, Canada.
Territory: Not limited.
Specialization: 2, 4, 8, 10, 16, 17. Also tropical logging.

**A. R. Gobeil**, Consulting Forest Engineer, 13 Place D'Aiguillon, Quebec, Canada.
Territory: Quebec.
Specialization: 4, 5, 7, 9, 13, 15, 18. Also purchase and sale of timbered properties, landscape engineering, and public relations.

**Nathan B. Golub**, Consulting Forester, Buckstone Farm, Washington Crossing, Pennsylvania.
Territory: Pennsylvania.
Specialization: 4, 15, 16, 17. Also water management plans. Registered engineer in Pennsylvania.

**Winslow L. Gooch**, Forestry Consultant, West Point, Virginia.
Territory: United States, Central and South America, Africa, Europe.
Specialization: 2, 3, 8, 11, 13, 15, 16, 17, 20, 21. Also investigations on vegetable tannin research, foreign cabinet timbers, and forest litigation.

**Norman H. Gray**, Consulting Forester, Fryeburg, Maine.
Territory: Maine, New Hampshire.
Specialization: 3, 4, 13, 15, 16, 17, 18.

**T. F. Grayson and Company**, Commercial Foresters, P. O. Box 1036, Texarkana, Arkansas, and P. O. Box 110, Prescott, Arkansas.
Territory: Southeastern U. S.
Specialization: 2, 4, 8, 10, 11, 13, 15, 16, 17, 18. Also timber purchase, sale, management, and millsite locations.

**Green's Timber Service**, Johnson City, Tennessee.
Consultant: L. Stanley Green.
Territory: Southeastern U. S.
Specialization: 2, 3, 4, 6, 10, 13, 16, 17, 18. Also custom sawmilling.

**Clarence W. Griffith**, 1001 Ouachita Bank Building, Monroe, Louisiana.
Territory: United States and Central America.
Specialization: 4, 15, 16, 17. Also purchase and sale of timbered properties.

**Alvin B. Hafer**, Consulting Forester, Laurinburg, North Carolina.
Territory: North Carolina, South Carolina, and Southeast.
Specialization: 4, 15, 16, 17. Also purchase and sale of timbered properties.

**E. C. Haff**, Forester, 836 Edisto Avenue, N.W., Orangeburg, South Carolina.
Territory: Within 100 miles of Orangeburg.
Specialization: Management of timber properties.

**Albert G. Hall and Associates**, 1740 K Street, NW, Washington 6, D. C.
Specialization: 2, 3, 4, 5, 6, 7, 8, 11, 13, 16, 17, 18. Also Washington representation.

**Giles G. Hall**, Forest Consultant, Apt. 1-C, Savannah Terrace, North Agusto, South Carolina.
Territory: South Carolina, Georgia.
Specialization: 2, 3, 4, 5, 6, 7, 10, 11, 13, 16, 17, 18. Also tree pruning in planted stands.

**Hammon, Jensen, and Wallen**, Mapping and Forestry Services, 1209 8th Avenue, Oakland 6, California.
Consultants: Herbert A. Jensen, Arnold F. Wallen.
Territory: Principally California, Nevada, and the Southwest, but also elsewhere.
Specialization: 2, 3, 4, 6, 8, 10, 11, 13, 15, 16, 17, 18. Also planimetric and topographic mapping, land net delineation, general land classification for appraisal purposes and ranchland management, and aerial photogrammetric consulting service. Emphasis on aerial photo techniques in all activities.

**David H. Hanaburgh**, Consulting Forester, Buchanan, New York.
Territory: Northeast.
Specialization: 2, 3, 4, 9, 10, 11, 13, 16, 17. Also negotiation of rights for hunting, fishing, trapping, and water storage.

**Ralph C. Hawley**, Consulting Forester, R. D. 1, West Cheshire, Connecticut.
Territory: Northeast.
Specialization: 4, 6, 16, 18.

**Ralph W. Hayes**, Consulting Forester, 2241 Myrtle Avenue, Baton Rouge, Louisiana.
Territory: Gulf States.
Specialization: 2, 3, 13, 15, 16, 17. Also investigation and settlement of claims regarding timber in use in the South.

**K. J. Helmick**, Consulting Forester, Fort Collins, Colorado.
Territory: Colorado, Wyoming, South Dakota, Utah, New Mexico.
Specialization: 4, 10, 15, 16, 17.

**Hiram L. Henderson**, Manufacturer of Dry Kilns, 119 Stone Ridge Drive, Syracuse, New York.
Territory: Principally eastern states.
Specialization: 20. Also construction of lumber dry kilns.

**Halsey M. Hicks**, Consulting Forester, R. F. D. 3, Brattleboro, Vermont.
Territory: Vermont, New Hampshire, Massachusetts.
Specialization: 2, 3, 4, 8, 15, 16, 17.

**Hamilton D. Hill**, Consulting Forester, Glacier Creek Ranch, Seeley Lake, Montana.
Territory: Northern Rocky Mountain region.
Specialization: 4, 15, 16, 17, 18. Also highway location and construction surveys; detailed topographic surveying and mapping preliminary to irrigation.

**Monterey L. Holst**, Consulting Forester, P. O. Box 125, East Greenwich, Rhode Island.
Territory: New England.
Specialization: 3, 4, 6, 9, 10, 13, 15, 16, 17, 18, 21.

**Richard F. Howard**, 15 Cherry Street, Franklinville, New York.
Territory: Pennsylvania, New York, New England.
Specialization: 3, 4, 6, 15, 16, 17, 18.

**T. M. Howerton, Jr.**, Consulting Forester, Madison, Florida.
Territory: Southeastern states.
Specialization: 2, 3, 4, 5, 6, 7, 10, 11, 12, 13, 15, 16, 17, 18. Also forest land acquisition, marketing of forest products, and land management.

**James L. Huff**, Consulting Forester, Dillon, South Carolina.
Territory: North Carolina, South Carolina.
Specialization. 4, 6, 10, 16, 18.

**G. W. Hult**, Consulting Forester, 3029 Johnson Street, Corvallis, Oregon.
Territory: Oregon, California, and southwestern U. S.
Specialization: 4, 16, 17. Also farm woodland management; negotiation of cooperative sustained yield units; timber sales, acquisition, and exchanges.

**George D. Hunter**, Consulting Forester, P. O. Box 244, Latham, New York.
Territory: New York and New England.
Specialization: 1. Also landscape design.

**LeRoy W. Huntington**, Consulting Tropical Forester, 52 Wesley Street, Baldwin, New York.
Territory: Latin America, Orient, Africa.
Specialization: 2, 3, 4, 10, 11, 15, 16, 17, 18; and tropical hardwoods.

**R. Wilson Hutchison**, Consulting Forester and Logging Engineer, 720 Harlow Road, Eugene, Oregon.
Territory: Washington, Oregon, California.
Specialization: 2, 3, 4, 6, 10, 15, 16, 17. Registered professional engineer of the State of Oregon.

**Gorham E. Jackson**, Consulting Forester, 1035 Respass Street, Washington, North Carolina.
Territory: Eastern North Carolina, southeastern Virginia. All forest types.
Specialization: 2, 4, 6, 9, 10, 13, 15, 16, 17, 18. Also investigations of forest resources for pulp and paper companies, and land agent for absentee timberland owners.

**M. E. Jelley**, Consulting Forester, 122 Haywood Avenue, Chattanooga 5, Tennessee.
Territory: Southeastern and eastern states.
Specialization: 2, 3, 4, 6, 8, 10, 11, 13, 15, 16, 17.

**David G. Jennings**, Consulting Forester, 206 Chestnut Street, Port Jefferson, New York.
Territory: New York.
Specialization: 1, 3, 4, 6, 15, 18.

**E. V. Jetter**, Consulting Forester, 30 Cedarlawn Drive, Dayton 5, Ohio.
Territory: Ohio.
Specialization: 3, 4, 6, 9, 11, 16, 17, 18. Also development and management of community forests, conservation education, cooperation with soil conservation districts.

**Stuart G. Keedwell**, Consulting Forester, Emporia, Virginia.
Territory: Eastern and southern U.S.
Specializantion: 3, 4, 10, 11, 13, 15, 16, 17. Also forest litigation and purchase and sale of land and timber.

**John F. Kellogg**, Forester, Flora, Louisiana.
Territory: Louisiana and southern Arkansas; pine and hardwood.
Specialization: 3, 4, 5, 16, 17.

**Henry S. Kernan**, Consulting Forester, South Worcester, New York.
Territory: Central New York.
Specialization: 3, 4, 5, 6, 7, 9, 10, 13, 15, 16, 17, 18.

**H. Thorn King**, Consulting Forester and Land Surveyor, Hancock, New Hampshire. (S.A.F. Affiliate Member.)
Territory: Southwestern New Hampshire.
Specialization: 2, 3, 4, 15, 16, 17, 18. Also private and farm forestry, scaling, marking, surveying, and title investigation.

**G. E. Knapp**, Consulting Forester, 661 Forest Hill Road, Macon, Georgia.
Territory, Southern states.
Specialization: 2, 4, 10, 11, 13, 16, 17, 18.

**Robert F. Knoth & Company**, Foresters, Appraisers, Surveyors, 39 Broad Street, Charleston 3, South Carolina.
Consultants: Robert F. Knoth, Joseph A. Schmidt.
Territory: American, Canadian and tropical timberlands. No restrictions.
Specialization: 4, 6, 10, 11, 13, 15, 16, 17, 18. Land agent for absentee timberland owners; foreign timberland investigations; veneer log inspection and procurement.

**The Langdale Company**, P. O. Box 980, Valdosta, Georgia.
Consultants: Harley Langdale, Jr., T. E. Connell.
Territory: Georgia, northern Florida: slash pine belt.
Specialization: 2, 3, 4, 6, 8, 9, 10, 11, 12, 13, 15, 16, 17, 18, 19. Also custom sawing.

**Wilfred H. Lauer, Jr.**, Consulting Forester, P. O. Box 329, Winona, Minnesota.
Territory: North Central States.
Specialization: 3, 4, 10, 11, 13, 16, 17, 20. Also tree selection and marking for cutting; log scaling and grading; marketing and products brokerage; and private, industrial, and farm forestry.

**Frank J. Lemieux**, Consulting Forester, 734 Whitney Building, New Orleans, Louisiana.
Territory: Southern states, Mexico, Central and South America.
Specialization: 2, 4, 6, 13, 15, 16, 17.

**Paul C. Lemon**, Consulting Forester, State College, Albany 3, New York.
Territory: New York.
Specialization: 1, 6, 9, 14. Also commercial pilot, applications of aviation to forestry.

**T. A. Liefeld**, Consulting Forester, Thomasville, Georgia.
Territory: Florida, Georgia.
Specialization: 2, 3, 4, 5, 6, 7, 8, 11, 12, 13, 15, 16, 17, 18.

**Ludwig Bros.**, Engineers, 608 South Fair Oaks Avenue, Pasadena 2, California.
Consultant: Gordon W. Ludwig.
Territory: California.
Specialization: 2, 4, 6, 7, 15, 16, 17, 18. Also specialist in soils and soil science. Associated with registered civil engineers specializing in sewage and water treatment.

**Donald K. Maissurow**, Consulting Forester, New Haven Avenue, Derby, Connecticut.
Territory: New England.
Specialization: 1, 4, 5, 7, 15, 16, 17, 18. Also landscape forestry.

**Chas. O. Marston**, Consulting Forester and Engineer, 1326 Charnelton Street, Eugene, Oregon.
Territory: Washington, Oregon, California.
Specialization: 2, 4, 10, 16, 17, 18. Also agent for absentee timberland owners.

**Marvin & Theno**, Forest Engineers, 112½ South 6th Street, Grants Pass, Oregon.
Consultant: Douglas J. Theno.
Territory: Oregon, California, Washington.
Specialization: 4, 10, 15, 16, 17.

**Mason, Bruce, & Girard**, Consulting Foresters, American Bank Building, Portland 5, Oregon.
Consultants: David T. Mason, James W. Girard, Karl D. Henze, Gilbert M. Bowe.

**F. Douglas Mavor**, Consulting Forester and Logging Engineer, 13039 - 8th Avenue, N.W., Seattle, Washington.

**Earl M. McChesney**, Consulting Forester, 4 New York Street, Bangor, Maine.
Territory: Maine, New York.
Specialization: 1, 4, 15, 17, 18. Also personnel work.

**Thomas A. McFarland**, Consulting and Contracting Forester, Sandersville, Georgia.
Territory: Georgia.
Specialization: 2, 4, 10, 15, 16, 17, 18. Also timber, timberland, and farmland broker.

**Philip C. Meinzer**, Consulting Forester, 1131 N. Indiana, Kokomo, Indiana.
Territory: Indiana.
Specialization: 1, 4, 16, 17, 18.

**Fred B. Merrill**, Consulting Forester, Box 66, Zachary, Louisiana.
Territory: Mississippi and Louisiana, within 100 miles of Baton Rouge.
Specialization: 4, 5, 6, 7, 11, 16, 17. Also buying and selling timberlands; training estate and company personnel; and Gaylord pulpwood dealer in East and West Feliciana Parishes.

**William J. Mills**, Forest Engineer, 530 Volunteer Building, Chattanooga 2, Tennessee.
Territory: Southeastern states, all forest types; Mexico, oak.
Specialization: 3, 4, 11, 13, 15, 16, 17.

**Malcolm A. Milne**, Consulting Forester and Landscape Engineer, 433 Clay Avenue, Rochester, New York.
Territory: Central and western New York.
Specialization: 1, 5, 7, 18. Also landscaping, estate development and management, and forest recreation.

**R. B. Milne**, Consulting Forester, Box 371, Petersburg, Virginia.
Territory: Eastern states; all forest types.
Specialization: 3, 4, 10, 16, 17.

**Stuart Moir**, Forest Counsel, Western Forestry and Conservation Association, 712 U. S. National Bank Building, Portland 4, Oregon.
Territory: Western states.

**Wm. Mollenhauer, Jr.**, Landuse Consultant, 186 West Avenue, Pitman, New Jersey.
Territory: New Jersey.
Specialization: 4. Also flood and

erosion control; ecological surveys of plant and animal relations in forest and rural areas; economic and social surveys of forest and rural areas, including labor relations.

**Robert Moore,** Consulting Forester, Danville, Pennsylvania.
Territory: Not restricted.
Specialization: 2, 3, 4, 6, 8, 10, 11, 13, 15, 16, 17, 18, 19. Also bankruptcy cases, trade association work, coal lands, trusteeship cases, litigation and damage claims; estate problems.

**Kenneth J. Morgan,** Consulting Forester, Stephen F. Austin State College, Nacogdoches, Texas.
Territory: Texas and the East.
Specialization: 1, 3, 4, 15, 16, 17, 18. Also farm forestry, erosion control, and general protection.

**W. Morris Morgan,** Consulting Forester, Tennessee Valley Forest Managers, Inc., Box 511, Athens, Tennessee.
Territory: Southeastern U.S.
Specialization: 4, 16, 17. Also operational management of forest properties, and custom sawing.

**George W. Morrill, Jr.,** Consulting Forester, 13½ South Spring Street, Concord, New Hampshire.
Territory: New Hampshire, Maine, Vermont.
Specialization: 1, 4, 15, 18. Also landscaping, forest recreation, and beautification.

**Lee H. Morrow,** Consulting Forester, Box 105, Warriors Mark, Pennsylvania.
Territory: Pennsylvania.
Specialization: 1, 2, 3, 4, 5, 6, 7, 10, 11, 13, 15, 16, 17, 18. Also erosion control of large embankments by engineering structures and vegetative treatment; and property maps and forest type maps from aerial photographs.

**Allen W. Neff,** Consulting Forester, Reed's Ferry, New Hampshire.
Territory: Southern New Hampshire.
Specialization: 4, 13, 15, 17, 18.

**A. Z. Nelson,** Consulting Forester, New Ipswich, New Hampshire.
Territory: U. S., Canada, Alaska.
Specialization: 2, 4, 8, 11, 16, 17.

**New England Forestry Foundation,** 3 Joy Street, Boston 8, Massachusetts.
Consultants: Harris A. Reynolds, Walter W. Dwyer, Jr., Kenneth E. Jones, J. Milton Attridge, Walter L. Koenig, Stanley B. Coville, Stephen L. Jacobs, Lyman H. Brigham.
Territory: New England.
Specialization: 2, 3, 4, 5, 6, 7, 8, 9, 10, 13, 15, 16, 17, 18.

**New England Silvicultural Service,** Box 64, Brownsville, Vermont.
Consultant: Fred M. Hunt.
Territory: Central New England.
Specialization: 4, 10, 15, 16, 17, 18. Also management of pine plantations.

**Samuel A. Newman,** P. O. Box 156, Everett, Washington.
Territory: Washington.
Specialization: 8, 10, 15, 16, 17. Also aerial surveys and forest litigation.

**Leon A. Nix,** Consulting Forester and Logging Expert, Port Credit, Ontario, Canada.
Territory: Not limited.
Specialization: 2, 3, 4, 6, 10, 13, 15, 16, 17. Also farm woodlot management.

**W. R. Owens, Jr.,** Consulting Forester, Box 246, North Street Station, Nacogdoches, Texas.
Territory: Eastern Texas, Louisiana, the South in general.
Specialization: 4, 10, 12, 13, 15, 16, 17, 18.

**Gustave O. Piche,** Consulting Forest Engineer, 3667 St. Hubert Street, Montreal, Quebec, Canada.
Territory: Eastern Canada, particularly the Province of Quebec.
Specialization: 2, 3, 4, 13, 15, 16, 17, 18, 21. Also farm forestry.

**Pomeroy & McGowin,** Forest Managers, Monticello, Arkansas and Chapman, Alabama.
Consultants: L. K. Pomeroy, Julian F. McGowin (S.A.F. Associate Member), Z. W. White, Robert R. Eastment, T. R. Scott, B. F. Griffin, Victor C. Suneson.
Territory, Southern states.
Specialization: 4, 8, 17. Also aerial forest surveys.

**Pond & Moyer, Inc., Co.,** Consulting Foresters, 107 Homestead Road, Ithaca, New York.
Consultants: James D. Pond, Chas. H. Moyer.
Territory: New York and Northeast, Latin America; northern hardwoods, spruce-fir, central hardwoods, tropical woods.
Specialization: 1, 2, 3, 4, 8, 10, 11, 13, 15, 16, 17, 18, 21.

**Prentiss & Carlisle Company, Inc.,** Timberland Service—Engineers, 107 Court Street, Bangor, Maine.
Consultants: George T. Carlisle, Philip P. Clement, Robert W. Averill, George D. Carlisle, Edward K. Brann.
Territory: United States, Canada.
Specialization: 2, 3, 4, 8, 10, 11, 13, 15, 16, 17, 18.

**John G. Rawls Co.,** Consulting Foresters, 408 Rogers Avenue, Macon, Georgia.
Consultant: John G. Rawls (S.A.F. Affiliate Member).
Territory: Southeast.
Specialization: 10, 12, 13, 15, 16, 17.

**Arthur D. Read,** Consulting Forester, 308 Riggs Street, West Monroe, Louisiana.
Territory: Southern pine and hardwood region.
Specialization: 4, 15, 16, 17, 18. Emphasizing seed collection, establishment of pine tree nurseries and outplanting.

**Reed Forestry & Equipment Co.,** Consulting Foresters, Box 102, Smithfield, North Carolina.
Consultant: R. E. Reed.
Territory: Southeastern States; all forest types.
Specialization: 2, 3, 4, 11, 13, 15, 16, 17, 18. Also custom sawing and sale of forestry equipment.

**Tom Reimer,** Consulting Forester, Sylvester, Georgia.
Territory: Georgia, Florida, Alabama.
Specialization: 2, 3, 4, 6, 10, 12, 13, 15, 16, 17, 18.

**Donald C. Rock,** Consulting Forester and Engineer, Box 508, New Paris, Indiana.
Territory: Lake states and worldwide.
Specialization: 2, 4, 8, 10, 11, 13, 15, 16, 17, 18. Registered professional engineer. Timber cruising is a specialty.

**Frank I. Rockwell,** Consulting Forester and Landscape Architect, 614 Twelfth Avenue, Brookings, South Dakota.
Territory: Northern and western states, especially Great Lakes and Great Plains regions to West Coast.
Specialization: 1, 3, 4, 5, 6, 7, 8, 9, 14, 15, 16, 17, 18, 19. Also landscape engineering; farm and city forestry; park, farm, and land management, recreational planning.

**A. P. Russell,** Commercial and Industrial Forester, 11 Maplewood Drive, Sumter, South Carolina.
Territory: Not limited, but principally southern region.
Specialization: 2, 3, 4, 10, 11, 12, 13, 15, 16, 17, 18. Also forest resource surveys for industry, timberland acquisition and sales, contract logging supervising, log scaling and grading.

**Sable Mountain Corporation,** Rutland, Vermont.
Consultant: Richard C. Rose.
Territory: Central Vermont.
Specialization: 4, 15, 16, 17.

**Roy Dale Sanders,** Visual Education Technician, Rural Route 6, Evrodale, Brainerd, Minnesota.
Territory: Unlimited.
Specialization: Forester, wildlife technician, photographer. The entire production supervision of 16 millimeter color educational motion pictures, including script writing, direction, photography, editing, and sound supervision. Also production of all types of color and black and white still picture visual education material.

**C. D. Schultz and Co., Ltd.,** Timber Consultants, Registered Foresters, Professional Engineers, Timber Managers, B-102 Pacific Coast Fire Building, 325 Howe Street, Vancouver, British Columbia, Canada.
Consultants: C. D. Schultz, R. D. Schultz, and 9 members of Canadian Institute of Forestry.
Territory: British Columbia mainly, but no regional limitations.
Specialization: 2, 3, 4, 6, 8, 10, 11, 15, 16, 17, 18, 20. Also supervision of contract logging; timberland sales; log sales, management of timber holdings; aerial photographic surveys; aerial topographic mapping; fire hazard appraisals.

**Thomas F. Schweigert,** Consulting Forester, Walloon Lake, Michigan.
Territory: Northern half of Lower Peninsula and eastern half of Upper Peninsula, Michigan.
Specialization: 1, 4, 6, 15, 16, 17, 18. Also contract tree planting; registered land surveyor.

**H. C. Scott,** Arboriculturist and Landscape Engineer, Lookout Mountain, Tennessee.

Territory: Eastern states.
Specialization: 1. Also landscape construction and woodland improvement.

**James W. Sewall Company**, Consulting Foresters, Old Town, Maine and Port Arthur, Ontario, Canada.
Consultants: Frank M. Call, Charles G. Reed, Carleton C. Young, Jr.
Territory: Northeast.
Specialization: 3, 4, 5, 8, 13, 15, 16, 17, 18. Also aerial photography.

**James R. Simmons**, Consulting Forester, 30 Gordon Street, Bel Air, Maryland.
Territory: Eastern states.
Specialization: 2, 3, 4, 10, 11, 13, 14. 15, 16, 17, 18.

**Simmons and Stuart**, Consulting Foresters, Bel Air, Maryland or Burgess Store, Virginia.
Consultants: James R. Simmons, Edward Stuart.
Territory: Eastern states.
Specialization: 2, 3, 4, 10, 11, 13, 14, 15, 16, 17, 18. Also investigation and arbitration of claims; operational management in the manufacture and marketing of forest products.

**William R. Sizemore & Co.**, Foresters and Surveyors, Tallassee, Alabama.
Territory. Alabama.
Specialization: 2, 3, 4, 8, 10, 11, 13,

**Samuel S. Snook**, P. O. Box 521, Walterboro, South Carolina.
Territory: South Carolina.
Specialization: 4, 15, 16, 17.

**Seymour I. Somberg**, Forestry Aids, Manning, South Carolina.
Territory: Southeastern U. S.
Specialization: 2, 3, 4, 8, 10, 11, 13, 15, 16, 17, 20. Acquisition and management for investors; forest resource surveys for industry.

**Southwestern Forest Associates**, Consulting Foresters, 518 North Cedar Street, Little Rock, Arkansas.
Consultants: Arthur M. Emmerling, Robert Lee Cain.
Territory: Southern Missouri, Arkansas, Oklahoma, Texas, Louisiana.
Specialization: 2, 3, 4, 8, 10, 11, 13, 15, 16, 17, 18. Also industrial plant appraisals Southwide on aerial photography and aerial inventories.

**Frank Spearey**, Land Surveyor, Timber Estimator, and Consulting Forester, P. O. Box 547, Nacogdoches, Texas.
Territory: Gulf states.
Specialization: 4, 15, 16, 17. Also timber marking and marketing.

**Everett R. Stanford**, Consulting Forester, 409 North Atlantic Boulevard, Alhambra, California.
Territory: Southern California; mountain watersheds, recreational areas.
Specialization 1, 5, 6, 7, 18. Also forest watershed management, erosion control, mountain forest home sites, forest park planning and management, structural pest control.

**T. J. Starker and Son**, Route 4, 3755 Van Buren Street, Corvallis, Oregon.
Consultants: T. J. Starker, Bruce Starker.
Territory: Oregon, Washington.
Specialization: 1, 3, 4, 10, 16, 19, 21.

**J. P. Stauss**, Consulting Forester, Benton, Pennsylvania.
Territory: Northeast and Canada.
Specialization: 2, 3, 4, 8, 10, 11, 13, 15, 16, 17, 18. Also marketing and other forest products; litigation and damage claims.

**E. A. Sterling**, 39 Lake Avenue, Montrose, Pennsylvania.
Territory: General.
Specialization: 3, 4, 6, 13, 15, 16, 17, 18, 19.

**Raymond E. Stevens**, Consulting Forester, 419 Lyceum Building, Duluth 2, Minnesota.
Territory: Northern parts of Minnesota, Wisconsin.
Specialization: 4, 15, 16, 17, 18.

**Charles H. Stoddard**, Consulting and Operating Forester, Wolf Springs, Minong, Wisconsin.
Territory: Northern Lake states.
Specialization: 2, 4, 8, 10, 11, 13, 15, 16, 17, 18.

**Erroll Tarbox**, Consulting Forester, 3 Carver Street, Sanford, Maine.
Territory: Southern Maine, New Hampshire.
Specialization: 4, 16, 17.

**John F. Tillinghast**, Consulting Foresters, Clothier, West Virginia.
Consultants: John F. Tillinghast, Marvin Reed.
Territory: West Virginia, eastern Kentucky, western Virginia.
Specialization: 3, 4, 6, 15, 16, 17, 18, 19, 20. Timberlands in coal producing areas a specialty; services available on job basis or on annual retainer fee basis.

**Henry H. Tryon**, Consulting Forester, 258 Mountain Road, Cornwall-on-Hudson, New York.
Territory: New York and New England.
Specialization: 3, 4, 10, 15, 17, 18. Also specializing in sprout hardwood region.

**Myron S. Wall, Jr.**, Consulting Forester, 4612 Fegan Way, Sacramento, California.
Territory: California.
Specialization: 2, 3, 4, 6, 7, 10, 11, 15, 16, 17, 18. Also photo interpretation as applied to logging engineering, cruising, and mapping; timber sale supervision; scaling; and timber dispute arbitration.

**Robert D. Washburn**, Forestry Consultant, Route 1, Box 461, Marquette, Michigan.
Territory: Upper Michigan, northern Wisconsin.
Specialization: 4, 15, 16, 17. Also land appraisal.

**Edward H. Werner**, Consulting Forest Engineer, 1506 Broadway, Sacramento California.
Territory: Northern California, except coastal area.
Specialization: 3, 4, 10, 16. Also timber and log procurement, timber sale and logging contract specifications, state forest practice act regulations, timber trespass and timberland damage claim valuation, and exchange or acquisition of timber and range lands.

**J. Atwood Whitman**, Consulting Forester, Glendon, North Carolina.
Territory: Southern states.
Specialization: 4, 15, 16, 17, 18. Also forest damage appraisal, growth analysis, timber type maps, and municipal forestry.

**S. A. Wilde**, Soils Department, University of Wisconsin, Madison 6, Wisconsin.
Territory: Wisconsin, Minnesota, Michigan, Missouri, Illinois, Indiana, Ohio.
Specialization: 18. Including survey of forest tracts, selection of planting sites, management of forest nursery soils.

**Ellwood Wilson**, Consulting Forester, Box 305, Knowlton, Quebec, Canada.
Territory: Ontario, Quebec, New Brunswick, Nova Scotia, eastern U. S.
Specialization: 2, 4, 13, 16, 18.

**Richard E. Wilson**, 126 Kelvin Place, Ithaca, New York.
Territory: Not restricted.
Specialization: 18. Establishment and care of plantations.

**Donald W. Winters**, Consulting Forester, 2138 Spruce Street, Murphysboro, Illinois.
Territory: Indiana, Illinois, eastern Missouri, western Kentucky, and Tennessee.
Specialization: 4, 10, 13, 15, 16, 17, 18. Also valuation and appraisal of timberland for sale or purchase.

**J. E. Woodman**, Barnett Bank Building, Jacksonville 2, Florida.
Territory: Eastern United States and Canada.
Specialization: 3, 4, 12, 13, 16, 18.

**James G. Yoho**, Consulting Forester, 231 Elm Street, Nacogdoches, Texas.
Territory: Eastern Texas, Louisiana.
Specialization: 2, 3, 4, 5, 6, 7, 8, 10, 12, 13, 15, 16, 17, 18. Also forest mapping and timber estimating from aerial photographs.

# Consulting Foresters, Classified by States

Consulting Foresters are listed below according to the state in which each has headquarters.

**Alabama**
Pomeroy and McGowin
William R. Sizemore

**Arizona**

**Arkansas**
T. F. Grayson and Company
Pomeroy and McGowin
Southwestern Forest Associates

**California**
Charles H. Bunting
California Foresteering
Forest Managers, Inc.
Emanuel Fritz
Hammon, Jensen, and Wallen
Ludwig Bros.
Everett R. Stanford
Myron S. Wall, Jr.
Edward H. Werner

**Colorado**
K. J. Helmick

**Connecticut**
Connwood, Inc.
Ralph C. Hawley
Donald K. Maissurow

**Delaware**

**District of Columbia**
Albert G. Hall and Associates

**Florida**
Forest Managers, Inc.
T. M. Howerton, Jr.
J. E. Woodman

**Georgia**
Grover M. Conzet
G. E. Knapp
The Langdale Company
T. A. Liefeld
Thomas A. McFarland
John G. Rawls Co.
Tom Reimer

**Idaho**

**Illinois**
Donald W. Winters

**Indiana**
Philip C. Meinzer
Donald C. Rock

**Iowa**

**Kansas**
George M. Fisher

**Kentucky**

**Louisiana**
Henry L. Bango
Clarence W. Griffith
Ralph W. Hayes
John F. Kellogg
Frank J. Lemieux
Fred B. Merrill
Arthur D. Read

**Maine**
Philip T. Coolidge
Norman H. Gray
Earl M. McChesney
Prentiss & Carlisle Company, Inc.
James W. Sewall
Errol Tarbox

**Maryland**
James R. Simmons
Simmons & Stuart

**Massachusetts**
New England Forestry Foundation

**Michigan**
Thomas F. Schweigert
Robert D. Washburn

**Minnesota**
William T. Cox
Wilfred H. Lauer, Jr.
Roy Dale Sanders
Raymond E. Stevens

**Mississippi**
James W. Craig
Keith Cranston and Associates
Randle J. Dedeaux

**Missouri**

**Montana**
Hamilton D. Hill

**Nebraska**

**Nevada**

**New Hampshire**
John B. Evans
H. Thorn King
George W. Morrill, Jr.
Allen W. Neff.
A. Z. Nelson

**New Jersey**
Wm. Mollenhauer, Jr.

**New Mexico**
W. T. Doherty

**New York**
Allen W. Bratton
David B. Cook
David H. Hanaburgh
Hiram L. Henderson
Richard F. Howard
George D. Hunter
LeRoy W. Huntington
David G. Jennings
Henry S. Kernan
Paul C. Lemon
Malcolm A. Milne
Pond & Moyer, Inc., Co.
Henry H. Tryon
Richard E. Wilson

**North Carolina**
Thos. W. Alexander
Alvin B. Hafer
Gorham E. Jackson
Reed Forestry & Equipment Co.
J. Atwood Whitman

**North Dakota**

**Ohio**
John M. Crowl
E. V. Jotter

**Oklahoma**

**Oregon**
Bigley and Feiss, Foresters, Inc.
G. W. Hult
R. Wilson Hutchison
Chas. O. Marston
Marvin & Theno
Mason, Bruce, and Girard
Stuart Moir
T. J. Starker and Son

**Pennsylvania**
S. Gayley Atkinson
Reginald D. Forbes
R. C. Fraunberger
LeRoy Frontz
Nathan B. Golub
Robert Moore
Lee H. Morrow
J. F. Stauss
E. A. Sterling

**Rhode Island**
Monterey L. Holst

**South Carolina**
Jack C. Blakeney
Lewis M. Boice
Gordon Bowker
E. C. Haff
Giles G. Hall
James L. Huff
Robert F. Knoth & Company
A. P. Russell
Samuel S. Snook
Seymour I. Somberg

**South Dakota**
Frank I. Rockwell

**Tennessee**
Green's Timber Service
M. E. Jelley
William J. Mills
W. Morris Morgan
H. C. Scott

**Texas**
N. D. Canterbury
Kenneth J. Morgan
W. R. Owens, Jr.
Frank Spearey
James G. Yoho

**Utah**

**Vermont**
Halsey M. Hicks
New England Silvicultural Service
Sable Mountain Corporation

**Virginia**
Winslow L. Gooch
Stuart G. Keedwell
R. B. Milne
Simmons & Stuart

**Washington**
Ace Engineers and Surveyors
William A. Eastman, Jr.
F. Douglas Mayor
Samuel A. Newman

**West Virginia**
John F. Tillinghast

**Wisconsin**
George Banzhaf & Company
Charles H. Stoddard
S. A. Wilde

**Wyoming**

**Canada**
Belanger and Bourget
John D. Gilmour
A. R. Gobeil
Leon A. Nix
Gustave C. Piche
C. D. Schultz and Co., Ltd.
James W. Sewall Company
Ellwood Wilson

**Africa**
Nils B. Eckbo

# Foresters' Code of Ethics

*Adopted November 12, 1948*

The purpose of these canons is to formulate guiding principles of professional conduct for foresters in their relations with each other, with their employers, and with the public. The observance of these canons secures decent and honorable professional and human relationships, establishes enduring mutual confidence and respect, and enables the profession to give it maximum service.

### Professional Life

**1.** The professional forester will utilize his knowledge and skill for the benefit of society. He will cooperate in extending the effectiveness of the forestry profession by interchanging information and experience with other foresters, and by contributing to the work of forestry societies, associations, schools, and publications.

**2.** He will advertise only in a dignified manner, setting forth in truthful and factual statements the services he is prepared to render for his prospective clients and for the public.

### Relations with the Public

**3.** He will strive for correct and increasing knowledge of forestry and the dissemination of this knowledge, and will discourage and condemn the spreading of untrue, unfair, and exaggerated statements concerning forestry.

**4.** He will not issue statements, criticism, or arguments on matters connected with public forestry policies, without indicating, at the same time, on whose behalf he is acting.

**5.** When serving as an expert witness on forestry matters, in a public or private fact finding proceding, he will base his testimony on adequate knowledge of the subject matter, and render his opinion on his own honest convictions.

**6.** He will refrain from expressing publicly an opinion on a technical subject unless he is informed as to the facts relating thereto, and will not distort or withhold data of a substantial or other nature for the purpose of substantiating a point of view.

### Relations with Clients, Principals, and Employers

**7.** He will be loyal to his client or to the organization in which he is employed and will faithfully perform his work and assignments.

**8.** He will present clearly the consequences to be expected from deviations proposed if his professional forestry judgment is overruled by nontechnical authority in cases where he is responsible for the technical adequacy of forestry or related work.

**9.** He will not voluntarily disclose information concerning the business affairs of his employers, principals or clients, which they desire to keep confidential, unless express permission is first obtained.

**10.** He will not, without the full knowledge and consent of his client or employer, have an interest in any business which may influence his judgment in regard to the work for which he is engaged.

**11.** He will not, for the same service, accept compensation of any kind, other than from his client, principal, or employer, without full disclosure, knowledge, and consent of all parties concerned.

**12.** He will engage, or advise his client or employer to engage, other experts and specialists in forestry and related fields whenever the client's or employer's interests would be best served by such actions, and will cooperate freely with them in their work.

### Relations with Professional Foresters

**13.** He will at all times strive to protect the forestry profession collectively and individually from misrepresentation and misunderstanding.

**14.** He will aid in safeguarding the profession against the admission to its ranks, of persons unqualified because of lack of good moral character or of adequate training.

**15.** In writing or in speech he will be scrupulous to give full credit to others, in so far as his knowledge goes, for procedures and methods devised or discovered and ideas advanced or aid given.

**16.** He will not intentionally and without just cause, directly or indirectly, injure the reputation or business of another forester.

**17.** If he has substantial and convincing evidence of unprofessional conduct of a forester, he will present the information to the proper authority for action.

**18.** He will not compete with another forester on the basis of charges for work by underbidding through reduction of his quoted fee after being informed of the fee quoted by a competitor.

**19.** He will not use the advantages of a salaried position to compete unfairly with another forester.

**20.** He will not attempt to supplant another forester in a particular employment, after becoming aware that the latter has been definitely engaged.

**21.** He will not review the work of another forester, for the latter's employer, without the other's knowledge, unless the latter's connection with the work has been terminated.

**22.** He will base all letters of reference or oral recommendation on a fair and unbiased evaluation of the party concerned.

**23.** To the best of his ability he will support, work for, and adhere to the principles of the merit system of employment.

**24.** He will not participate in soliciting or collecting financial contributions from subordinates or employees for political purposes.

**25.** He will uphold the principle of appropriate and adequate compensation for those engaged in forestry work, including those in subordinate positions, as being in the public interest and maintaining the standards of the profession.

# The Society of American Foresters

The Society of American Foresters is a professional organization of technically trained foresters. It is a democratic, nonpolitical, nonprofit association of over 7,000 members.

As stated in its Constitution, the objects of the Society are to represent, advance, and protect the interests and standards of the profession of forestry, to provide a medium for exchange of professional thought, and to promote the science, practice, and standards of forestry in America.

Membership in the Society of American Foresters is recognition of a man's professional abilities and attainments. No person can acquire such recognition if it is not deserved.

The Society is governed by a president, vice president, and nine other Council members. Policies established by the Council are translated into action programs which are administered by the executive secretary whose office is in the Mills Building, Washington, D. C.

An annual meeting of the Society includes technical sessions arranged by the ten Divisions which specialize in silviculture, private forestry, forest economics, forest products, forest recreation, forest wildlife management, range management, public relations, and education. Other features of the meeting include sessions on general topics and a joint conference of the Council and Section delegates.

Sections are regional units of the Society. The United States, its territories, and Canada are divided into 21 Sections which elect their own officers, hold meetings, and conduct appropriate projects and activities. Many Sections have subsidiary units called Chapters which hold informal meetings and field trips to acquaint foresters with each other and with local forestry matters.

The JOURNAL OF FORESTRY is a monthly publication of the Society. Other publications include *Forestry Terminology, Fifty Years of Forestry, Foresters Field Manual* (now in preparation), and others.

Through its publications and meetings the Society provides a medium for the exchange of professional information and promotes cooperation among foresters and with those in alllied fields.

By encouraging its members to promote the adoption, use, and improvement of forestry practices, the Society endeavors to extend the benefits of good forestry practices to all timberland owners and users of forest products.

Through the operation of committees, by the functioning of Chapters, Sections, Divisions, and the Council, and by expressions of the membership through referendums, the Society helps establish the policies and standards to be observed by professional foresters.

# Forestry News

### Forestry Interest in East Central North Dakota

A very active Forestry and Conservation program has been under way at Fessenden in east central North Dakota for the past 4 years. Elmer Uniland, soil conservationist of the U. S. Soil Conservation Service office at Fessenden reports that since the fall of 1946 over 400 farmers have received detailed complete farm planning and conservation assistance. Uniland has also directed the planting of about 900 acres of trees in his area, and now is developing plans to plant several hundred acres more in the spring of 1951. All planting is done with two mechanical tree planters.

Tree Farm Dedication Ceremonies at Fessenden in June of 1950 were arranged in detail by the Fessenden office—at that ceremony, the first to be held in the state of North Dakota on a county basis, 39 farmers received Tree Farm Certificates. Since that time the Tree Farm System has spread through the Fessenden area and a hundred more farmers are ready to adopt the Tree Farm System.

An innovation, in an attempt to serve more farmers, has been instituted here. Several thousand trees were planted in fall of 1950 just prior to freeze-up, to relieve pressure at tree planting time in the spring. So far as is known, this is the first time that fall planting has been attempted on such a large scale in this section of the country.

### Railroad Pioneers in Seeding By Helicopter in Northwest

The Milwaukee Land Company, a subsidiary of the Milwaukee Road, recently completed in cooperation with the Long-Bell Lumber Company an aerial seeding project involving 800 acres of Milwaukee lands and 160 acres of land of the Long-Bell Company.

Distribution of the seed was controlled by maintaining a ground speed of 45 miles an hour at an elevation of around 200 feet and by cross-flying the area. The entire 960 acres was seeded in one day. Check plots are being established throughout the area to determine the effectiveness of the work.

### New Jersey Christmas Tree Farmers Form Association

The New Jersey Forestry and Christmas Tree Growers' Association has as its first president Col. Frederick Herr of Stanton. The charter of the new group was signed by 28 members.

Other officers elected are C. B. Hutchison of Cranbury, vice-president; Donald Dilatush, Robbinsville, treasurer, and Austin N. Lentz, Cranbury, secretary. Lentz is extension forester at the College of Agriculture, Rutgers University. These officers make up the executive committee, along with Eugene Beyer of Mt. Holly.

Officers will serve until a permanent organization is formed with adoption of a constitution during Farmers' Week in Trenton, Jan. 29-Feb. 3. The organization will serve as a focal point for information about Christmas tree growing and markets. It will also be concerned with wood; and management and timber marketing.

### Wyoming Shelterbelt and Improvement Contests

W. C. Deming, former president of the Board of Trustees of the University of Wyoming and a former newspaper man in Cheyenne, Wyoming, was the donor of $6,000 to the University in 1943. Mr. Deming died in 1949 at his home in Redlands, California. It was his desire that this gift be used for prizes covering 20 years to farm and ranch people in Wyoming who make rapid and successful strides in landscaping their homes and in planting shelterbelt trees.

Two contests—Farm Shelterbelt Planting, and Farm and Home Yard Improvement—have been conducted in Wyoming since 1943 and will continue until 1963. There are slightly less than 12,000 farms in the state, and during the first eight years of the contests 266 farmers and ranchers have entered the contests. To date, 69 prizes have been awarded in amounts of $50, $30, and $20.

The contests are conducted by the Agricultural Extension Service. Rules and regulations are outlined by W. O. Edmondson, extension forester and horticulturist.

### Barriers to Conservation To be Studied

Barriers in the pathway of application of conservation practices on the land will be the subject of studies at the Harvard School of Public Administration and the School of Law of the University of Pittsburgh, according to the joint announcement made by Fairfield Osborn, president of the Conservation Foundation, Dean Edward S. Mason of Harvard and Dean Charles B. Nutting, head of the University of Pittsburgh School of Law. The Conservation Foundation has sponsored both programs and has raised the funds to carry them out.

The Harvard project will take the form of a graduate seminar to identify the major obstacles now preventing widespread use of known conservation techniques on the soils, forests, grazing lands, and water sources of the United States and learn how to overcome such obstacles within the accepted principles of the free enterprise system. The course represents the first attempt to define the place and proper contributions of both private and governmental agencies at all levels.

At the University of Pittsburgh work will consist of a review and analysis of all statutes and administrative regulations dealing with conservation in the State of Pennsylvania, as well as a study of organization, coordination, and practice in administration.

### Forest Industry Group Elects

J. L. Camp, Jr., of the Camp Manufacturing Company, Franklin, Va., has been named to the board of directors of American Forest Products Industries, Inc. He succeeds P. H. Glatfelter, of the P. H. Glatfelter Company, of Spring Grove, Pa., who will continue as treasurer.

Officers and trustees include President J. F. McGowin, of the W. T. Smith Lumber Company, Chapman, Ala., Walter J. Damtoft, Champion Paper and Fibre Co., Canton, N. C., and Clyde S. Martin, Weyerhaeuser Timber Co., Tacoma, Wash., vice presidents; and Charles A. Gillett, Washington, D. C., secretary and managing director.

Col. W. B. Greeley, of Port Gamble, Wash., is chairman of the Board of Trustees.

## FAO Honors "Old-Timers"

Delegates to the 63-nation Conference of the Food and Agriculture Organization—the first of the permanent United Nations organizations to be established—paused in their deliberations November 8 to commemorate FAO's fifth anniversary and to wish the organization well in its impending transfer to Rome.

Foresters among the "old timers" introduced during the ceremony were: Lyle Watts, chief and E. I. Kotok, assistant chief, Forest Service, U. S. Department of Agriculture, and Tom Gill, secretary of the Charles Lathrop Pack Forestry Foundation.

## Members of O & C Advisory Board Named

The Secretary of the Interior has announced the membership of the O & C Advisory Board for 1951. The 18-man panel advises the Bureau of Land Management on forest management and land utilization policies for the revested and recovered O & C Railroad grant lands in western Oregon.

Each year new members are brought to the board by the department to extend participation on the panel and to give opportunity for the presentation of new points of view toward the land utilization program. At the same time, a sufficient number of members retained to give continuity and stability to program policy.

New members of the Advisory Board this year are: Glenn Jackson, Medford, Oreg., president of Southern Oregon Sugar Pine Corporation and vice-president of the California-Oregon Power Company; Roy F. Morse, Longview, Wash., vice-president of the Long-Bell Lumber Company; and Joseph W. Smith, Portland, Oreg., president of the Portland Chapter of the Izaak Walton League.

In addition to the three new members, the following—members of last year's board—have been reappointed to one year terms:

Paul Bailey, Northwestern Council of Lumber and Sawmill Workers, AFL, Portland. Bernard Buisman, editor, *Oregon Grange Bulletin*, Portland. Paul M. Dunn, dean, School of Forestry, Oregon State College, Corvallis. A. F. Hartung, first vice-president of the International Woodworkers of America (CIO), Portland. Frank Graham, Hills Creek Lumber Company, Willamette Valley Lumbermen's Association, Jasper. Fay W. Libbey, director, Oregon State Department of Geology and Mineral Industries, Portland. E. B. MacNaughton, president, Reed College, Portland. David T. Mason, consulting forester, Mason, Bruce & Girard, Portland. Stuart Moir, forest counsel, Western Forestry & Conservation Assn., Portland. George W. Peavy, mayor, Corvallis. Albert H. Powers, Oregon Cattlemen's Assn., Coos Bay. Frank S. Sever, attorney, Association of O and C Land Grant Counties, Portland. Charles A. Sprague, publisher, *Oregon Statesman*, Salem. Reginald T. Titus, executive vice-president, Western Forest Industries Assn., Portland. Dwight Phipps, acting state forester, Salem.

## Booklet Describes Westvaco

Westvaco Experimental Forest operated by the West Virginia Pulp and Paper Company at Georgetown, S. C. is described in an attractive booklet recently published by the company. This outdoor laboratory of some 20,000 acres was established in 1944 to develop practical and money-saving methods of harvesting and handling tree crops, to develop forest practices designed to protect growing tree and promote natural growth and reseeding, and to develop and test methods of seeding and planting.

Two views of a single scene, one dated 1940, the other 1950. By 1940 the virgin Douglas-fir forest of this land was all logged. It was a clearcutting. The snags were felled, to reduce fire hazard. Slash was burned. Down the hill, unseen in the picture, seed trees were left, located so that up-drafts of late fall winds would scatter seed. A forest-fire lookout was erected, with a protection road running to it. A forestry camp for summer fire guards was built.

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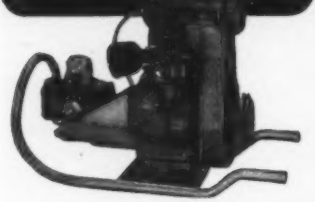

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## Positions Wanted

Graduate forester, 29, B.S.F., desires permanent position with forest-owning or wood-utilizing firm. Interest in research, has good chemical and technical background. Member S.A.F. and A. W. P. A. Details on request. **Box N, Journal of Forestry, Mills Building, Washington 6, D. C.**

Forester, 26, desires public relations job in forestry. B.S.F. University of Idaho 1948. M.F. University of Michigan 1950. Two years public relations experience. Detailed information upon request.
**Box L, Journal of Forestry, Mills Building, Washington 6, D. C.**

"Pat" Thompson, retiring after a lifetime of public service, is nationally known for his contributions to forest conservation. Son of a country newspaper editor, he grew up in the big-timber country of northwest Washington. He worked as a forest guard to finance his forestry studies, and received permanent appointment as forest guard in 1912 in Washington State.

After overseas service in World War I, Mr. Thompson survived some close escapes and scored outstanding achievements during critical fire seasons in the Pacific Northwest. From assistant regional forester at Missoula, Mont., he stepped to chief of personnel management for the Forest Service in 1939. He was chief of fire control for the service during World War II, when Japanese incendiary balloons menaced western forest resources. He was promoted to regional forester of the California region in November 1946.

### Meyer Wolff Retires

Meyer H. Wolff, assistant regional forester in charge of the Division of Land Use Coordination and Watershed Management for the Northern Region, U. S. Forest Service, retired December 31 after more than 41 years' service.

Mr. Wolff graduated from the Sheffield Scientific School of Yale University with a Ph.B. degree. He also has a master's degree in Forestry from Yale.

Entering the Forest Service in 1909, Mr. Wolff has spent his entire career in Region One in various capacities in Montana and Idaho national forests and in the Missoula office. He was made an assistant forest supervisor in 1911 and advanced to supervisor of the Coeur d'Alene Forest in 1914.

In 1920 he transferred from Coeur d'Alene to the regional office as a member of the Division of Forest Management. He was advanced to assistant regional forester in charge of the Division of Lands in 1922. He cooperated with the Resettlement Administration during its formation and has served as consultant on various defense and postwar resource management committees.

Mr. Wolff has been an active member of the Society of American Foresters for 35 years and is chairman of the Recreation Division of the Society. He has also been active with and is well-known to land utilization, irrigation, water power and recreation groups in the northwest and the Great Plains.

PETER W. FLETCHER has been appointed as an asso iate professor on the forestry department staff of the University of Missouri. He received the Ph.D. degree from the University of Missouri in August 1950, the thesis dealing with forest soil structure. He teaches courses in research methods in silviculture, forest influences, forest photogrammetry, and general forestry.

Fletcher has had extensive experience in the field of forestry, having been employed by the U. S. Forest Service, U. S. Department of Agri ulture since 1934 in various administrative and research positions. He served in the Mark Twain National Forest in Missouri as a junior forester, forest ranger, and fire control assistant. During the past eight years he was an assistant silviculturist and conservationist with the Southeastern Forest Experiment Station at Asheville, N. C.

During Wor'd War II he was a lieutenant in the Navy, doing aerial photographic interpretation and intelligence in the Pacific Theatre.

Fletcher received a B.S. in Forestry from The Pennsylvania State College and an M.F. from Yale University.

### Perry Thompson to Retire As Regional Forester

Perry A. Thompson, regional forester for the California region of the U. S. Forest Service, retired December 31 after 35 years in the service.

Clare W. Hendee of Denver, assistant regional forester of the Rocky Mountain region, will succeed Mr. Thompson. Mr. Hendee has 20 years' experience in forest resource management in western regions. With a degree of bachelor of science in forestry from Michigan State College, he started in the U. S. Forest Service in 1931. He served successively as forest ranger, assistant forest supervisor, and forest supervisor of Ottawa National Forest in Michigan, 1931-39; supervisor of Superior National Forest in Minnesota, 1939-44; and supervisor of Mt. Hood National Forest with headquarters in Portland, Oreg., 1944-46. Since 1946 he has been in the Rocky Mountain states, in charge of recreation and lands management for that region.

### Wisconsin Examines Program

The Wisconsin Conservation Department in 1950 pressed forward on its campaign to give a definite sense of direction to Wisconsin land management.

The department points out that it is losing ground where its limited management efforts are more than offset by wholesale land and water usages that deplete the general inventory of state values.

The coming session of the legislature is expected to give serious consideration to a proposal to set up a state resources board aimed to correlate the efforts of many agencies working in the outdoor field and frequently at cross-purposes. The proposal for a resources board follows a detailed report by Conservation Director Ernest Swift listing the many agencies now carrying on unrelated programs of outdoor development and sometimes undoing the efforts of one another. The conservation department is restoring marshes for wildlife. Elsewhere marshes are being drained on the advice and with the help of other agencies.

The need for a recapture of basic values in conservation will be further emphasized in a second report planned by Swift. The new report as far as possible will detail the original land assets of Wisconsin, what has happened to them, and the current efforts of the conservation department to restore them.

In the fight to retain and build back major values, the year has seen encouraging accomplishments. Forest fire losses have been negligible. More than 20,000,000 forest trees were planted. The year's start on factual deer management promises a better deer herd and a new start in forest regeneration.

The year marked the first overall study of the extensive forestry activities of the conservation department with that work now being managed by three divisions. Col. W. B. Greeley was employed by the conservation commission and made an intensive survey to determine possible improved methods of management. The survey covered the activities of the forest protection division, forest and parks division, and the cooperative forestry division.

The state forest inventory of 32 northern and central Wisconsin counties is ending its first year of a 3-year program. The work will be based on complete aerial mapping and for the first time Wisconsin will have factual data as to the present and potential wood supply, present pulpwood and sawtimber volume, and the rate of production. The survey will be vital in future management procedures.

In the forest areas, the department through the year worked with 27 counties in the management of 2,092,566 acres of county forests which have become an outstanding state asset. In agricultural areas, the department worked with 1,142 land owners in the management of 47,435 acres of woodlands and southern Wisconsin landowners had the help of department extension workers in fitting lands for better wildlife.

Wisconsin has had notable success in protecting its forests against fire but entomologists see a great production loss to insects and disease. The state has launched a program of forest entomology and hopes to be able to check small centers of infestation as they occur to avoid costly epidemics.

### Program Announced, Southern Agricultural Workers Meeting

The Forestry Section, Association of Southern Agricultural Workers, will hold its annual meeting February 5, 6, and 7 at the Peabody Hotel, Memphis, Tenn.

Included in the program are papers by I. T. Haig, director, Southeastern Forest Experiment Station, "Southern Pine Tree Improvement Through Tree Breeding and Seed Selection"; Spence B. Chase, Tree Crop Unit, Tennessee Valley Authority, "Progress with Forest Tree Crops"; Edwin C. Crafts, division of forest economics, U. S. Forest Service, "Economic Problems in Forest Management and Utilization"; J. N. Stepp and J. R. Parker, South Carolina Experiment Station, "Research Problems in Disposal of Farm Woodland Products"; and A. D. Folweiler, director, Texas Forest Service, "Marginal Felling Operations."

W. Forest Cowan, Tennessee Division of Forestry will discuss "Hardwood Management in Tennessee." Russell Stadelman, forester, Nickey Brothers, Inc., will explain "Nickey Brothers Program of Cooperative Hardwood Management of Small Woodland Tracts." H. L. Person and P. R. Kramer of the Southern Forest Experiment Station and the Texas Forest Service, respectively, will present a paper on "The Classification of Low Grade Logs and Trees in Upland Hardwood Management"; and Roy Carter, director, Wood Products Laboratory, N. C. State College: "Progress in Using Low Quality Hardwoods."


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Illinois Central Photo
D. E. Lauderburn, Soil Conservation Service forester, is seen inspecting the home made log-jack made by tree farmer Louie Pennington, of Lawrence County, Miss. Approximate dimensions of the simple machine are shown by the 18-in h rule held in Mr. Lauderburn's hand. The log-jack was made from o'd "middle buster" plow beam and plank. Its use was first observed by Mr. Lauderburn and J. G. Guthrie, Illinois Central Railroad forester.

## Forest Service Engineer Transferred

Henry M. Shank, formerly chief of engineering for the Intermountain Region of the U. S. Forest Service at Ogden, Utah, has been named assistant regional forester in charge of engineering for the Rocky Mountain Region, with headquarters at Denver, Colo.

Mr. Shank for the past five years has conducted a survey of national forest roads and trails throughout the United States. He will succeed Carl A. Gould, who retired December 31.

Joining the U. S. Forest Service at Ogden in 1921 as a surveyor, Mr. Shank worked successively as associate civil engineer, fire control officer, forest supervisor of the Payette National Forest, and as chief of engineering until his assignment to the nation-wide road and trail study which he has just completed.

He was employed as a civil engineer by the Salt Lake County Highway Department, by the Utah-Idaho Sugar Company on irrigation surveys, and by the Nevada Highway Department on highway location before entering the Forest Service. He was an engineering officer with the A.E.F. during World War I and is a member of long standing in the American Society of Civil Engineers and the Society of American Foresters.

## Logging Demonstration Held On Purdue Farm

Fifteen hundred visitors — farmers, woodland owners, foresters, and sawmill operators — were on hand for the first Indiana logging and sawmilling show near Bedford on October 25 and 26. The two-day show, held on the Purdue Moses-Fell Annex Farm, was designed to show the latest in logging and sawmilling equipment in actual operation.

Four models of chain saws were shown each morning in actual woods operation felling and bucking. The trees being cut were overmature beech and black oak which had been previously marked for removal by Purdue foresters.

After the trees had been felled, limbed, and bucked, skidding and yarding operations were shown to the interested crowd. Various late models of tractors, log carts, and other skidding equipment were demonstrated.

Wood chopping and sawing contests were held during the noon hour.

Afternoons were devoted to log loading demonstrations and sawmill operations. Two portable mills and one stationary mill were in full operation and the portability of the former was well demonstrated with actual setting-up time being twelve minutes. The logs cut and skidded during the morning were loaded on trucks and delivered to the mill. Several of the latest log loading devices were shown in operation, including a self-loading truck. The lumber sawed was promptly piled for air drying to show the proper way of piling green lumber.

The show was sponsored by the extension service of Purdue University and Roy C. Brundage of the forestry department. Co-sponsoring the event was the Central States Forest Experiment Station with R. K. Day in charge. Cooperating agencies included the Indiana Hardwood Lumbermen's Association, Indiana State Division of Forestry, Wayne-Hoosier National Forest, and the Bedford Chamber of Commerce.


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## Large Tree Farm Dedicated

One of the nation's largest tree farms was established near Charleston, S. C., on November 9 when members of the South Carolina Tree Farm Committee certified 340,000 acres of timberland owned and operated by West Virginia Pulp and Paper Company.

The timberlands, located in nine counties, were approved for membership in the national tree farm system following a study of the company's timber management practices and inspection of its acreage by forest conservation officials.

The greater part of the timberland is managed by the company's Southern Woodlands Department, located at Summerville, which employs a crew of about 200 men to protect and maintain the properties. The lands are operated under a timber management plan designed to produce maximum growth, harvest and regrowth of timber in the shortest possible time, with stress on natural regeneration to produce a continuous crop of trees for pulpwood and other products. In the past five years the company has planted 7,500,000 seedlings on 11,000 acres.

Six radio-equipped fire observation towers, fire warden patrols, some with two-way radio patrol cars, and in severe fire seasons, a plane patrol, protect the timberlands against fire. All tracts are guarded by plowed fire lanes.

Included in the Tree Farm property is 20,000 acres of timberland operated and managed as the Westvaco Experimental Forest, which serves as a practical laboratory for studying and developing improved methods of growing and harvesting tree crops.

The land also includes a forestry camp maintained for forestry students of Duke University.

## Interior Without Authority on San Jacinto Tramway

Secretary of the Interior Oscar L. Chapman has stated that he lacks the authority to approve the request of the Mt. San Jacinto Winter Park Authority for right-of-way to build a tramway across public lands of the San Bernardino National Forest.

The tramway is proposed to carry passengers to a recreational area planned for the San Jacinto State Park, adjacent to the San Jacinto Primitive Area.

The application for the right-of-way was based on the supposition that the Act of 1899, which gave the Secretary of the Interior authority to approve the ". . . right-of-way for a wagon road, railroad, or other highway over and across any forest reservation . . .", would also apply to aerial tramways.

The Department of the Interior's Office of the Solicitor has stated, however that "an aerial tramway is not a 'wagon road, railroad, or other highway' within the meaning of the Act of March 3, 1899, and, therefore, that act does not authorize the Secretary of the Interior to grant a right-of-way in a national forest for an aerial tramway."

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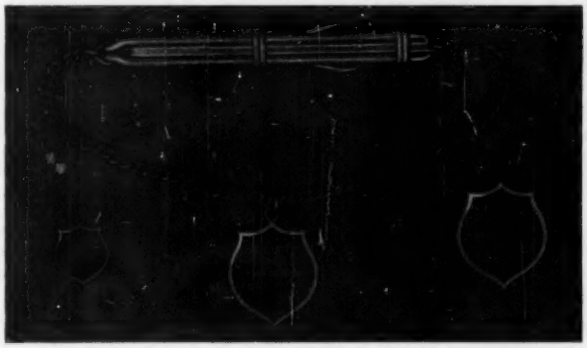

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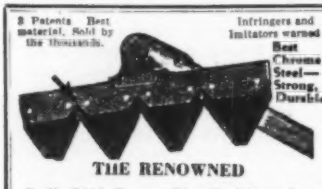

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## Wagner New President of NLMA

Corydon Wagner was elected president of the National Lumber Manufacturers Association for 1951 at NLMA's annual meeting in Houston, Tex. Nov. 13-16. H. M. Seaman, executive vice president, Kirby Lumber Company, Houston, Texas and retiring president of the association, was named chairman of the board.

Wagner is vice president and treasurer of the St. Paul and Tacoma Lumber Company, Tacoma, Wash. A former president of the West Coast Lumbermen's Association, he served in 1942-43 as a regional vice president of NLMA and last year as first vice president. In 1945 he was elected president of the American Forest Products Industries, Inc. and served as a trustee of that group from 1941 to 1947.

Chairmanship of the board is a new position created at the Houston meeting. An advisory policy committee was also formed; its membership will include the chairman of the board, the president and first vice president, plus all past presidents of the association. Under a new policy adopted at the meeting, each NLMA president will hereafter serve for one year, after which he will become chairman of the board, and the following year assume chairmanship of the advisory policy committee. A. J. Glassow, vice president and general manager, Brooks-Scanlon Inc., Bend, Oreg., who served as NLMA president prior to Mr. Seaman, becomes chairman of the newly created policy group.

The board went on record favoring limitation of government research in the housing field to projects which cannot be handled by facilities available to private industry. It also passed a resolution advocating a special "defense tax" at a uniform rate to be super-imposed on regular normal and surtax corporate rates.

The NLMA forest conservation committee presented a number of resolutions which were approved. These included a revision of the forest policy statement, a recommendation relating to federal acquisition of forest lands, provision for a survey to determine the extent of industry's interest in forest fire insurance, and a recommendation for study of federal legislation pertaining to dam construction as it affects timber resource management and development.

The board approved a recommendation of the forest conservation committee that the association undertake a research project to be called "Improvement of Fire Resistance of Lumber and Lumber Assemblies."

The NLMA hardwood research committee approved programs for the utilization of low-grade hardwoods, improvement of furniture, a soil improver project, a nitric acid pulping process, and utilization of waste.

## Portland C of C Sponsors Sawmill Power Experiment

The Oregon Forest Products laboratory, located on the Oregon State college campus, will undertake a research project designed to make possible the utilization of wood wastes in generating power for sawmills as the result of a $2,000 grant from the Portland Chamber of Commerce.

George H. Atherton, a laboratory mechanical engineer who conceived the idea, is constructing a pilot plant to determine the industrial feasibility of the process that would eventually result, if experiments are successful, in the design of a compact, light-weight, portable source of energy for sawmills and other operations.

The new type of gas-operated turbine would have wide application in the Pacific Northwest lumber industry as it would make use of materials such as sawdust, hogged fuel, and shavings now largely unused. At the same time it would provide power for sawmills and other plants isolated from electrical and water power.

Gas to operate the turbine is generated by burning wood under pressure in a specially designed furnace. Work in progress is aimed at determining the size of furnace required to operate a turbine large enough to supply power for a small mill.

Cooperating with the laboratory are the Oregon State College engineering experiment station, which is contributing equipment and professional assistance, and the Boeing Airplane company of Seattle which is providing technical data.

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## Forestry College Auditorium Named for Dr. Hugh P. Baker

In tribute to Dr. Hugh Potter Baker, first dean of the college, trustees of the State University College of Forestry, Syracuse, New York, have voted to give the name "Baker Auditorium" to the auditorium of the Louis Marshall Memorial Building at the college .

The auditorium has received almost daily use by groups from the College of Forestry, Syracuse University, and the community since it was completed in 1933. It accommodates 550 persons.

The trustees' action requested that the college's oil portrait of Dr. Baker be hung in or near the auditorium, with an appropriate plaque. The portrait was given the college by Mrs. Baker after the former dean died in Florida May 24, 1950. He organized the educational program of the New York State College of Forestry upon his appointment to the deanship in 1912, a year after the institution had been chartered by the legislature. He pioneered the departmentalization of forestry education, an innovation which broke with tradition at the time, but has since been generally accepted as the pattern of modern forestry education.

After 8 years' service, Dr. Baker resigned for other responsibilities until his re-appointment in 1929. He left the College of Forestry early in 1933 to become president of the then Massachusetts State College. At his death he was president emeritus of that institution, which had become the University of Massachusetts during his tenure.

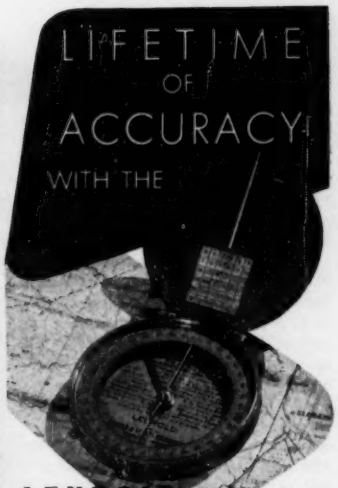
The College of Forestry trustees, in accepting the recommendation of a committee of their members, specifically left the way open to naming a future building of the college in honor of Dean Baker. They referred to the projected wood products building which has been approved by the state of New York for construction next year. Training in the technology of converting timber into wood products is one of the specialized curricula that Dr. Baker inaugurated at the college.

## Booklet on Palms

Palms are second only to grasses as useful plants, according to Agriculture Information Bulletin No. 22, *Palm Trees in the United States*, written by Dr. Miriam L. Bomhard, U. S. Forest Service. It brings together information on American palms from widely scattered sources and is designed to acquaint people with this unique group of woody plants.

The bulletin features 12 of the 14 native palms that are either trees or that become treelike.

The 32-page, illustrated booklet may be purchased from the Superintendent of Documents, Government Printing Office, Washington, D. C., for 15 cents.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### Fred Thieme Retires

Assistant regional forester Fred Thieme, Missoula, Mont., retired from the Forest Service December 31. Mr. Thieme had been in charge of regional engineering activities for the past 29 years and had spent a total of over 39 years in government work, all in the Northern Region.

A native of Helena, Mr. Thieme holds a University of Montana B.S. degree in engineering and an honorary M.S. degree in forest engineering bestowed by the university in 1939. He entered the Forest Service in 1908 as a member of a land exchange survey party. In 1912 he directed topographic survey crews on the Cabinet and Kaniksu Forests. He went to the Missoula regional office as a surveyor and in 1913 was placed in charge of entry and public land surveys. In 1921 he was promoted to assistant regional forester as chief of all engineering work for the Northern Region.

Howard R. Jones is transferring from the Washington, D. C., office of the Forest Service to succeed Mr. Thieme. Mr. Jones was born in Missoula, studied forestry at the University of Montana and has a B.S. degree in Engineering from the University of Washington.

He is a member of the Society of American Foresters and the American Society of Civil Engineers and in 1948 was president of the Montana section of Civil Engineers.

### Oregon Fellowships Awarded

The awarding of nine graduate fellowships through the School of Forestry Oregon State College for the year 1950-51 is announced by Paul M. Dunn, dean of the school. The men will major in forest management, forest products, or wood chemistry and be eligible for advanced degrees in June 1951. Five other graduate students are also enrolled in the school for the current year.

The Weyerhaeuser Fellowship of $1,000 was awarded to Arthur W. Holmes of Prospect, Oreg., who is a graduate of the University of California and has been working for the Prospect Timber Corporation since 1947. This grant is made available by the Weyerhaeuser Timber Foundation for studies in the field of forest management.

Two grants of $1,000 each from the Orville R. Miller Research Fund were made to James E. Smith of Newberg, Oreg., and George M. Tokos of Shelton, Wash. These men will major in wood chemistry and their research projects will be associated with the program of the Oregon Forest Products Laboratory, and under the immediate direction of Dr. E. F. Kurth. This fund was made available by the family of the late Mr. Orville R. Miller of Portland, to be expended in furthering forestry in Oregon.

Six fellowships of $540 each from the McDonald Fellowship Fund were granted to Wade H. Howell, Jr. of Morgantown, West Virginia; Robert M. Kimberly of Stamford, Connecticut; Raymond H. Leech of McAdam, New Brunswick, Canada; Milford D. McKimmy of Beaverton, Michigan; Walter L. Robinson of Grace, Idaho; and Roy Van Voorhies of Quinault, Washington. McKimmy is majoring in forest products and the others in forest management. The funds were provided by the late Mrs. Mary J. L. McDonald who also was generous in respect to grants for forest land acquisition by the College. The McDonald Forest was named in her honor.


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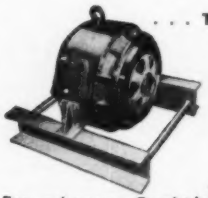

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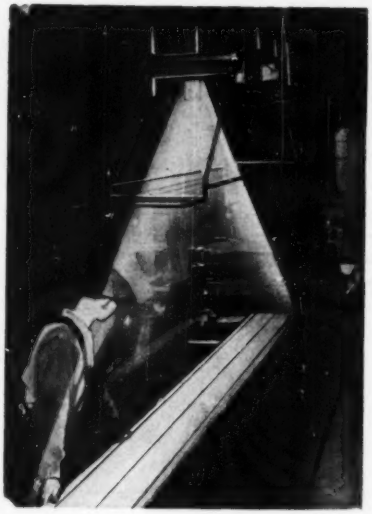

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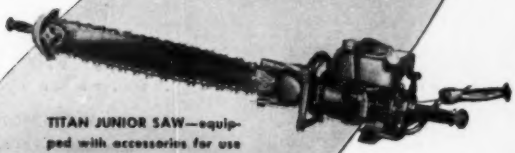

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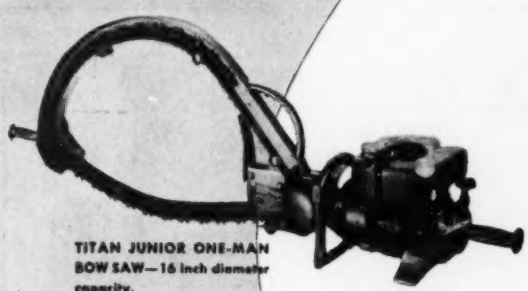

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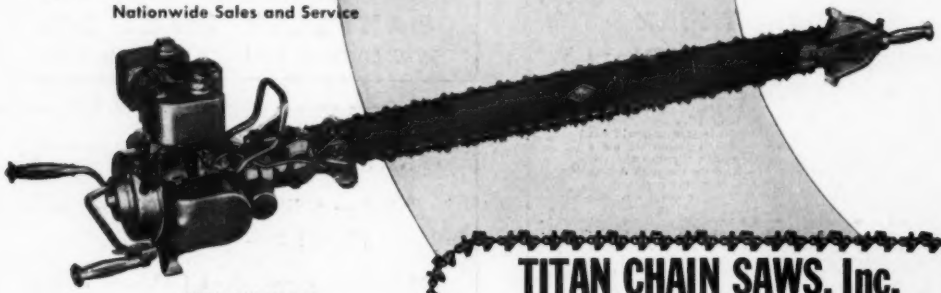

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